DOCUMENT RESUME

ED 075 028 JC 730 099

AUTHOR	Gooler, Dennis D., Ed.
TITLE	Uses of Technology in Community Colleges: A Resource Book for Community College Teachers and Administrators.
INSTITUTION	Syracuse Univ. Research Corp., N.Y. Educational Policy Research Center.
SPONS AGENCY	New York State Education Dept., Albany. Bureau of Occupational Education Research.
REPORT NO	TR-72-674
PUB DATE	Dec 72
NOTE	156p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Audiovisual Aids; Classroom Materials; Community Colleges; *Guides; *Instructional Innovation; Instructional Materials; Post Secondary Education; *Resource Materials

ABSTRACT

This resource guide for community college teachers and administrators focuses on hardware and software. The following are discussed: (1) individual technologies--computer-assisted instruction, audio tape, films, filmstrips/slides, dial access, programmed instruction, learning activity packages, video cassettes, cable TV, independent learning labs, simulations; and (2) programs of interest--pervasive problems (getting faculty to take advantage of resources, training faculty, the need to create incentives to facilitate the faculty's use of instructional innovations), Central Piedmont Community College, Oakland Community College, and Monroe Community College. A bibliography of additional resources is followed by a list of places to obtain more information about ongoing projects. (KM)

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USES OF TECHNOLOGY IN COMMUNITY COLLEGES

A RESOURCE BOOK FOR COMMUNITY COLLEGE TEACHERS AND ADMINISTRATORS

DENNIS D. GOOLER, EDITOR

TR 72-674
DECEMBER, 1972

JC 730 099

UNIVERSITY OF CALIF.
LOS ANGELES

MAY 18 1973

CLEARINGHOUSE FOR
JUNIOR COLLEGE
INFORMATION

SURC

SYRACUSE UNIVERSITY RESEARCH CORPORATION

This book was developed in the Area of Instructional Technology, Syracuse University, pursuant to a subcontract (C53173) from the Educational Policy Research Center, Syracuse University Research Corporation. Original contract to EPRC from New York State Education Department, Bureau of Occupational Educational Research.

PREFACE

There are seemingly an infinite variety of ways in which technology can be utilized in instructional settings. There also exists a considerable number of definitions of the term technology. To some, technology refers to hardware. To others, technology is the systematic application of scientific principles to problems. To still others, technology means the creative use of both hardware and software in teaching.

This book talks about technology, particularly as technology is used in community colleges. Much of what is discussed is hardware and/or software. Other things thought legitimate elements of technology, such as alternative teaching strategies, research, and evaluation, are not fully discussed, only because of the limitations of time. Technology is not, in the view of the editor, only machines. Nonetheless, both hardware and software are indeed instructional resources. They can be used in the instructional process in community colleges. They require the expenditure of institutional resources. Choices about hardware and software will be made. This book represents a tentative step toward helping community college personnel make more informed choices.

The book has been assembled with the help of many people. Initial drafts of the individual sections were developed by one author, revised and edited by a second or third author. Those who have contributed to the initial drafts include:

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Michael Maginn of Syracuse University played a major role in editing and creating the format of the book. Martha Strain contributed art work, and Malorie Edelson assisted with copy editing.

Thanks are due to all of these people. Each would affirm the beginning nature of the work.

Dennis D. Gooler, Editor
Syracuse, N.Y.
November 15, 1972

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INTRODUCTION

Uses of Technology in Community Colleges

The teacher or administrator in a community college is faced with a dilemma: there is a bewildering quantity of educational hardware and software in existence. At the same time, there is a discouraging lack of materials and know-how for using technology. Despite the apparent abundance of stuff, any single educator is likely to have difficulty finding just the right materials or techniques to do the job the way it should be done.

The occupational education instructor is no exception to this broad generalization. It is extremely difficult for the individual instructor to know where creative materials are located, or to know of the existance of unique uses of various technologies. Further, it is always difficult to know in what ways to allocate precious, finite instructional resources.

It is in recognition of the immense difficulties involved in knowing how to harness technologies for instructional purposes that this resource book has been begun. Provided in these pages are the beginnings, and only the beginnings, of materials that will enable the occupational educator to consider the potentials and limitations of various kinds of technologies for use in occupational education programs in community colleges.

Organization of the Resource Book

There are two sections to the Resource Book. Section I seeks to describe each of a number of extant technologies. Section II seeks to describe in case study format several community colleges that are presently engaging in innovative uses of technology.

Most of the individual technologies included in Section I are described by considering the following areas:

1. Introduction
2. General Educational Advantages of the Technology
3. General Educational Limitations of the Technology
4. Relevant Research Findings
5. Community College Uses
6. Cost Considerations
7. Relevant Resources

How to Use this Resource Book

This resource book is not intended to be read from cover-to-cover. The book is divided in such a way as to provide quick access to background materials on a given technology, and to several case studies of places where a variety of technologies are being used. It is hoped that the reader will either consult the table of contents for a particular technology, or will read the several case studies for ideas he might pursue further.

Limitations of the Book

It is recognized that the book provides general information about various technologies. The book will always need additional entries. No attempt has been made to provide a catalog of available films, tapes, etc., although references are given as to where such catalogs might be obtained.

Further, the book does not purport to provide in-depth suggestions as to which technology will be most likely to be instrumental in the achievement of specific goals. What is needed to supplement this resource book is an extensive treatment of how to develop specifications for various technologies.

PART ONE

INDIVIDUAL TECHNOLOGIES

Paul Elliott

COMPUTER ASSISTED INSTRUCTION

PROBLEM: Inhalation therapy techniques are being taught to a student nurse. As part of her classroom instruction, she is required to recommend treatment for various conditions. What kind of instructional technique would give her the best experience with a variety of therapeutic practices so she can quickly see the effect of her recommendations without endangering a real patient?

PROBLEM: An auto mechanics student is working on the ignition system of a car engine. He is not sure of the procedure in adjusting a dwell angle with a multimeter. How can he receive immediate remedial help and, at the same time, find out if his dwell angle adjustments were correct?

PROBLEM: An appliance repair student is faced with the repair of a malfunctioning television set. How can he learn to determine the source of the problem and test his proposed solution?

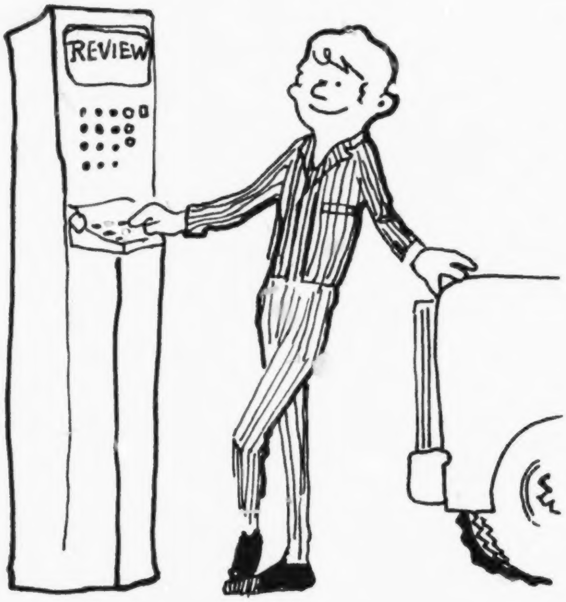
AN EXCITING ANSWER TO THESE INSTRUCTIONAL PROBLEMS???......

...........................CAI!

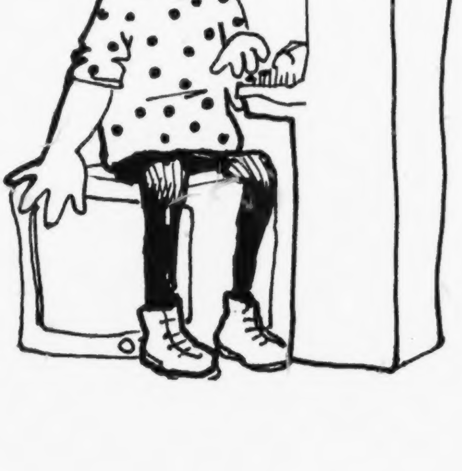
A central Computer Assisted Instruction system is adaptable to each of these three instructional problems. This versatile tool can be designed to interact with the learning/teaching process in a number of ways.

In the student nurse's task, for instance, a computer can be programmed to simulate a patient and his responses. Then a treatment can be "administered" by typing into a terminal or into a mock-up model which interprets the treatment and responds with information on blood pressure, pulse rate, etc., reflecting the effectiveness of the student's decision.

Similarly, the auto mechanic may receive individualized instruction on ignition systems from a CAI terminal located at a Learning Resource Center on campus. In the shop he can refer to a computer terminal to review previously covered material. Even more exciting, however, the diagnostic equipment he is using can be interfaced with the terminal, serving as an input to the instructional program. The student's terminal in the shop now monitors and responds to the performance of the real engine, providing additional information when needed and informing the student when he has performed the task within the limits acceptable to the instructor.



The appliance repair student can sit down at a terminal and ask the computer appropriate questions to get as much information as possible regarding the malfunction of the television set. Once the electronic "customer" has provided a description of the problem, the student must proceed with further tests to find its source. All the while, the computer can monitor the student's activities, providing information on the appropriateness of the various tests selected and offering guidance when needed.



Zinn (1970) has specified three ways in which the computer can directly aid instruction: 1) Tutoring, 2) Simulation, and 3) Information analysis.

TUTORING includes the computer equivalent of programmed instruction. The program-teacher, after having defined his objectives, may choose to organize his material either as a drill, a programmed frame-by-frame lesson, or as a dialogue allowing interaction and initiative by the student.

SIMULATION and gaming are a second way the computer can aid instruction. Simulations are attempts to model the real world; games usually model a less realistic situation. Both may involve competition among learners or the computer.

INFORMATION ANALYSIS is a method which makes use of the computer. Here it serves as a tool to arrange, analyze, and present information.

OTHER AREAS IN WHICH THE COMPUTER CAN AID EDUCATION

In research, for example, the computer has been used as a study tool in higher education since the mid-1950's. Faculty members in many disciplines use the computer for computation, data processing, simulation, and problem solving in their research inquiries.

More recently, the computer has been increasingly used for the retrieval of scientific information. Generally, these systems are specialized according to the discipline in which they are used (psychology, political science, chemistry, etc.).

Educators are also considering information retrieval by computer on a broader scale. For instance, Hampshire College, Amherst, Massachusetts, is attempting to incorporate a computer retrieval system in its library.

In management, the applications of computers range from straightforward academic record keeping and more complex scheduling procedures to systems models for forecasting future trends. These applications are being rapidly adapted for use in secondary and elementary education.

Computer Managed Instruction (CMI) is another management application developed for individualized instruction. In operation, a CMI system keeps track of performance as each student proceeds at his own pace through an instructional module composed of various media and methods.

But There Are Some
LIMITATIONS

Computer Assisted Instruction (CAI) has not yet been as widely applied in instruction as it has in research and management. In spite of the potential for computers to become a highly flexible aid to learning, most CAI formats have thus far centered on drill and practice and linear programmed instruction. Uses in simulation, gaming, and analysis have been few. Bushnell (1970) criticizes that most CAI systems do little more than dispense instruction "on a fixed, preprogrammed sequence of graded material."

This has led to CAI's reputation as an expensive -- a very expensive -- container of programmed instruction. However, Stolurow (1970) has warned against this conclusion saying:

"Projections based on today's systems would have the same degree of fidelity as projections based on the Wright brothers' first plane would have had for predicting the design of the supersonic transport."

Furthermore...

Long-term evaluations of CAI programs have not been forthcoming in the literature. As Parkus (1970) notes:

> "There has been practically no systematic assessment and evaluation of the effects of the use of Computer Assisted Instruction where it has been employed. In some cases, CAI installations have not had access to qualified evaluation personnel. In others, the individuals responsible for CAI have been preoccupied with myriad problems accompanying the introduction of a highly innovative program and, therefore, have postponed evaluation... There is an urgent need to deeply involve specialists in learning research from the university community in the systematic assessment and evaluation of present and future Computer Assisted Instruction applications."

HOW EFFECTIVE IS CAI?

Research findings indicate:

> Students seem to learn at least as well with CAI as with conventional classroom instruction. Some researchers indicate that greater learning and retention can occur with CAI.
>
> CAI can provide learning and retention at least equivalent to conventional techniques in the same amount of time. Some reports indicate a significant reduction in time required.
>
> The computer can reduce certain kinds of tedious work usually required of the student.
>
> Students are generally interested in and enjoy the CAI form of instruction.
>
> Learning time and learning effectiveness with CAI depend upon the interaction of a number of factors, including the type of instructional program, learning style of the students, and attitudes of teachers and students.

SO WHAT'S IN STORE FOR THE FUTURE?

While some CAI Projects have stressed the development of validated instruction and research in human learning, others have emphasized the potential of hardware and software in the presentation and preparation of materials.

HARDWARE DEVELOPMENTS: Although most CAI projects have adapted existing hardware to meet the needs of education, there have been some projects where hardware is specially designed for the educational situation. One example is the IBM 1500 system, which incorporates standard hardware and student terminals specially designed for the educational environment. Another excellent example is the new PLATO IV configuration developed at the University of Illinois. (Bitzer, Skaperdog, 1971) In this design, an entirely new display device, the plasma panel, was developed to overcome the problem of image regeneration on a standard cathode ray tube, a requirement which proved quite costly to maintain. Once a plasma panel is turned on by the computer, however, the image remains until the panel receives another command to change or turn off. The constant need for image "refreshing" by the computer using this tube has been eliminated.

SOFTWARE DEVELOPMENTS: CAI software development has been taking place in several areas of interest. The majority of developmental work has been in designing programming systems and analyzing student performance. In the former, an "author" language used for programming instructional materials is being created to meet the needs of instructors and school personnel who are not familiar with computer technology. At the same time, the language should not restrict an author from using the full capabilities of the computer system.

Editing procedures are being developed so that authors may revise, the contents of the system. Easy editing routines are an absolute necessity if users are to adapt and revise materials on the basis of student performance.

Judging routines for student response are also under scrutiny. It might be simple for a computer to check a multiple-choice response. However, since the mode of response should be appropriate to the content of instruction and to the students' characteristics, multiple-choice responses are not always a correct mode. However, with student-constructed responses, the judging routines can become very complex, involving checks for spelling errors, word order, and the like. Software to accomplish this task is a necessary requirement for any CAI system to reach full effectiveness. Research in this area has been extensive.

Analysis routines for student performance are necessary to give the programmer-instructor feedback information concerning the effectiveness of his instruction and the progress of his students. Although the computer has the potential to collect an infinite amount of this feedback data, not all of it would be useful to the instructor. In fact, in raw form, it would be next to worthless. Projects on data collection and analysis of student performance have attempted to determine the relative importance of data and how this relevant material may best be analyzed and presented to students, instructors, and programmers.

MORE R & D: TWO PROJECTS

CAI hardware and software development projects and the instructional research surrounding computer applications in education have extended over more than a decade. At this point, it is now possible to test the possibilities and potentials of CAI in a large-scale, carefully evaluated demonstration project. Two such projects have been funded by the National Science Foundation to extend over the next several years. They are of particular interest to community college personnel because both are to be implemented in some part at cooperating community colleges.

The MITRE Project is a joint effort of the Mitre Corp., the University of Texas CAI Laboratory, and Brigham Young University's Research and Development Division. The project is aimed exclusively at a community college audience, hopefully serving as a catalyst for the mass demonstration of CAI methods and equipment design.

The project's hardware system includes the use of small computers and commercial television technology, making terminal hours cost as low as 25¢ to 50¢ for non profit community colleges. In addition, a terminal capable of delivering instructional movies, interactive computer-delivered graphics, as well as voice and text, has been developed. The project is also using a distribution system which incorporates cable TV as a transmission medium, enabling the entire campus to be wired economically. The total package, furthermore, is designed for individual community colleges and other institutions at a cost of about $200,000.

Four full-semester courses are being developed for use in the program. These will emphasize learner control of instructional strategy as a means to "humanize" the process and to minimize the inadequacies of the hardware.

The PLATO IV Project is being undertaken by the Computer-based Educational Research Laboratory at the University of Illinois, Urbana. The project has been divided into two main directions of development, with one focusing on reading and mathematics at the elementary school level and the other on community colleges. At the community college level, sequences of free-standing modules, as they are called, may be used individually or in sets, depending on the instructor's needs. Modules in the following areas are in the process of development: accounting, auto mechanics, biology, chemistry, English, the GED, mathematics, and nursing.

This PLATO software can be used in a wide range of instructional applications--drill and practice, tutoring, simulation and gaming, and general information processing. The programming language, called TUTOR, is designed for use by faculty members who have no background in computer programming.

The PLATO hardware is a unique configuration designed specifically for educational applications. Projected cost estimates for capital investment and operating expenses range from 35¢ to 70¢ per student contact hour. One method that has been used to reduce costs is the Plasma display device, mentioned earlier.

IN SUMMARY

CAI can be used in instruction, research, and educational management.

Three main instructional uses are: 1) drill and practice and programmed instruction, 2) simulation and gaming, and 3) information analysis.

Research has used computers since the mid-1950's. Information retrieval for research projects is now a trend.

Management applications include record keeping and systems modeling.

A limitation of CAI is that the process hasn't been used to its fullest potential. Up to now, development has been slow. A formal evaluation of the technology has just recently begun to take place.

Research findings show that as an instructional medium, CAI works; i.e., it can instruct. How well it can instruct depends on the interaction of a number of factors.

R & D is under way in hardware and software development. As current projects become validated and evaluated, they will reveal new creations and applications that will reduce costs and expand CAI's capabilities.

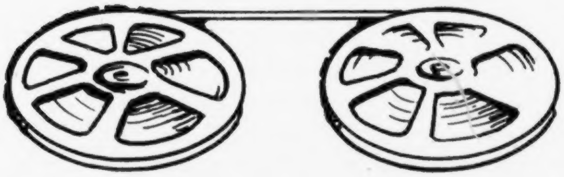
Louis Pullano

AUDIO TAPE: PORTABLE PACKAGE OF LEARNING

To many individuals, the audio tape recorder is as familiar as the home television receiver. As with most other communication equipment in schools, business, or homes, the tape recorder is capable of playing back what has been recorded or received. Until the advent of video tape recording, the audio tape was the only instant recording medium that replayed without delay.

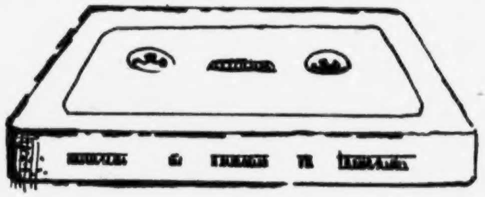
Audio tape, in other words, plays and records without processing — a very significant feature for instructional situations. As long as the tape recording equipment is well maintained, the quality of its recordings will be consistently high. These features make audio tape distinctly different from all other media currently used in education. Unfortunately, because many individuals are familiar with audio tape only as an entertainment medium, its instructional potential is often neglected. With imagination, some truly creative and innovative uses can be developed, incorporating the advantages of instant electronic processing and high quality. In a school situation, these features are bound to provide interesting and insightful instruction in almost every course of study.

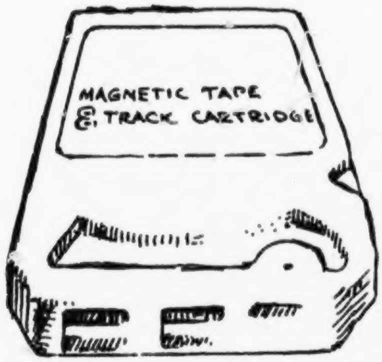
THE BASIC THREE FORMATS FOR AUDIO TAPE



The Open Reel: This is the earliest format developed. Open reel sizes range from 3" to 7". Playback/record time is between 3 min. and two hours, depending on equipment speed and length of tape. Tape size is 1/4" wide.

The Cassette: This format is one of the latest developments in audio recording. Tapes are 1/8" wide, and each is contained in a small plastic holder which incorporates supply and rewind reels. The cassette is extremely easy to use as it requires no threading and records on small, compact, lightweight equipment.





The Cartridge: The cartridge is another recent development in recording formats. The standard eight-track cartridge contains an endless loop system capable of playing back several hours of recorded material. Self-cuing devices are also popular for use in cartridges. The tape is 1/4" wide.

Like the cassette, the cartridge requires no threading. In operation, it is inserted into a playback/record slot. Playback and recording can be accomplished on the same equipment, which tends to be less portable than cassette machinery. Cartridges are extremely rugged and compact.

POTENTIALS OF AUDIO TAPE? READ ON....

In a nutshell, audio tape can be used efficiently in four areas of instruction. How they are used within each area is left to the creativity and imagination of students, administrators, and instructors. But before innovative uses are examined, note the areas in which audio tape can be applied to enhance instruction.

FIRST, one salient function of audio tape is to disseminate information. Information could mean lecture material, steps in a procedural process, questions, discussions — a world of facts the student must absorb.

SECOND, audio tape can also be used for guided listening activities. Radio or television material may be recorded and replayed. Concerts, dramatic readings, commentary, or analytical essays — commonly called "cultural enrichment" programs — may be pre-recorded by commercial publishing companies or produced locally with simple, inexpensive equipment.

THIRD, an important area of application lies in the information gathering feature of audio tape. Since many audio tape recorders are portable and battery operated, they can be used "on location," recording speeches, meetings, interviews, observations and on-the-spot impressions, and descriptions. For example, newspaper reporters have used portable cassette recorders for several years in place of the traditional pad and pencil. The opportunities for student application in report writing or in relating information gathered on location to a class group have not been tapped in many school situations.

WORLD'S END IMMINENT.. etc etc...

FINALLY, the playback-record capability allows both the student and teacher to evaluate performance. For example, a debate team and drama student can review their speech patterns, and a foreign language student can inspect his own voice for proper pronunciation. Instructors can use audio tape as a feedback device in responding to a student's essay, spoken dramatization, language drill, and the like. More complete evaluations are possible with this method, allowing the teacher to expand the comments he often relegates to the margins of a term paper.

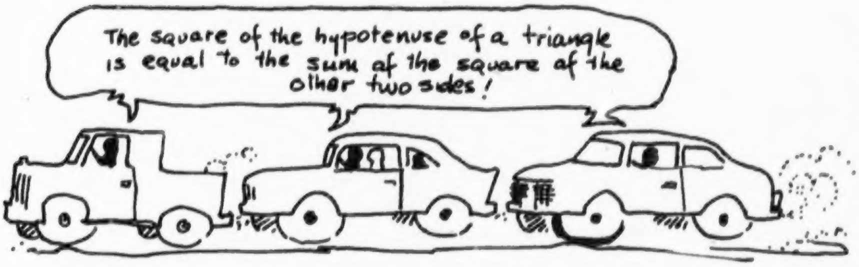
AUDIO TAPES IN COMMUNITY COLLEGES: PUTTING IMAGINATION TO WORK

For many years in community colleges, the audio tape recorder has been assigned to language labs, music listening centers, and audio-visual presentations. More recently, applications in auto-tutorial programs are becoming more widespread. Some truly innovative uses of tape recordings are also available — applications that free the tape, the recorder, and the student from being institution-bound.

A portable tape recorder can be taken to a physical therapy department of a hospital, for instance, recording notes, questions, observations, and the real dialogue that transpires.

For students who are returning to education after an absence of several years, audio tapes can be used for refresher courses. They can be sent to the students' homes by mail. Also, for students whose working hours are erratic, the audio tape may be available as a means for making up missed classes or lectures either at home or at school.

electrons, atoms, ions, atomic power, etc...


The square of the hypotenuse of a triangle is equal to the sum of the square of the other two sides!

Students can check out cassettes or pre-recorded materials for use in their car. In this way, commuting time can be put to great advantage.

Audio tapes can be recorded by instructors and then circulated among regional community colleges, a type of "audio publishing." Specific objectives can be met through resource sharing. For example, an innovative approach to teaching an electronic testing device can be relayed from school to school by mailing tape cassettes.

Reports, essays, and opinions can be recorded as an alternative to writing.

Examinations might be put on cassettes with instructions from the teacher. Students may respond either by, recording their answers into tape or by writing them down.

Lab interviews can be simulated on audio tape.

On-the-job experiences recorded as they happen can provide powerful information for the orientation of new students.

Remedial instruction may be recorded by an instructor on audio tapes, providing an easy, productive, simple-to-use source for students who require background information.

Obviously these are only a few of the many imaginative, innovative uses of audio tape in a school situation. As we shall see below, since most recorders can be purchased for under $50.00, each student can either buy his own or rent one from the school, giving everyone in the instructional community a common tool on which to record and playback information.

THE ADVANTAGES OF AUDIO TAPE

In addition to the production features mentioned earlier — instant playback and good quality — recorded audio tapes can be replayed over and over without any loss of quality, providing the playback equipment is well maintained.

But perhaps the greatest advantage of using audio tape instruction is the availability of both tapes and recorders. Tape cassettes can be purchased for as little as 60¢ each. Cassette recorders cost between $25.00 and $125, the average being $40.00 to $50.00. Certain models of reel-to-reel and tape cartridge equipment can also be purchased inexpensively.

A boon to the use of audio tape in instruction is the rapidly increasing availability of pre-recorded instructional tapes. A typical commercial catalog, for example, lists pre-recorded tapes which range from nursery rhymes to mini-kits on Shakespeare and twentieth century poets. The number of companies which have entered this field is growing daily.

Another extremely important aspect of the use of audio tape is the rapid increase in tape loan and tape duplicating services. The National Center for Audio Tapes, at the University of Colorado, Boulder, is a joint undertaking of the NEA Department of A-V Instruction and the National Association of Educational Broadcasters. The Center has 12,000 programs available for purchase in either the cassette or open-reel format. The 1970-72 National Center for Audio Tapes Catalog can be purchased for $4.50 and the Guidelines for Audio Tape Libraries can be obtained for $1.00.

THE DISADVANTAGES OF AUDIO TAPE

The limitations associated with audio tape are not difficult to overcome. For instance, a rough, unfamiliar "touch" with reel-to-reel equipment, can cause the tape to spill off the reel, break, or jam.

Difficulty locating specific items recorded on a tape or cartridge in any format is a problem. If the recorded message is in the middle of the reel, cassette, or cartridge, it would be hard to find. A counter measuring feet per second is usually available on reel-to-reel recorders. However, these devices are not always reliable. Cartridges have the capability of self-cuing; that is, a pre-recorded segment is automatically ready for replay as soon as it is inserted in the playback slot.

Some recordings made on a two-track recorder are incompatible with single-track playback devices. Use of single-track playback machines should be carefully coordinated with the types of tapes purchased or recorded for instruction.

IN SUMMARY: A BRIEF REPLAY

Audio tape can be replayed thousands of times without loss of quality; equipment must be maintained, of course, and tape heads must be cleaned and degaussed on a regular basis.

The majority of audio tape recorders are portable. Cassette recorders are often quite small, compact, and battery-powered. Reel-to-reel tape recorders have been designed with over-the-shoulder carrying cases. Various types of microphones can be used for optimal quality in location recording.

Cassettes, reel-to-reel tapes, or cartridges can all be played back through sophisticated amplifying equipment which enhances fidelity of sound and allows for high-quality presentations.

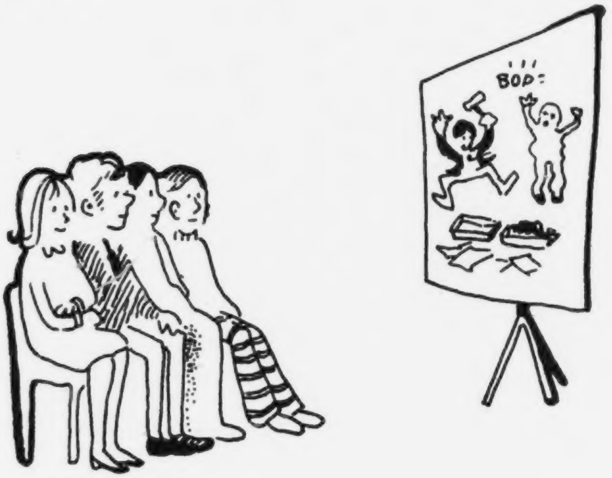
Pre-recorded tape "publications" are becoming available from commercial production companies.

The innovative uses of audio tape are only limited by the imagination of the users. With the advent of cassette formats, new applications have been developed.

Joseph Durzo

FILMS: THE UBIQUITOUS MEDIUM

A large group of students in an introductory electricity/electronics course are being taught basic concepts and principles involving subatomic particles. What type of instruction can best demonstrate these abstract phenomena to the group, as well as provide meaningful commentary?



Business students must learn how to deal with an angry customer in a store. How can they observe carefully planned and accurately portrayed examples of various interaction techniques?

Chemistry students have just begun a unit on petroleum refinement. Is there any way their laboratory experience with industrial processes can become "real" to them so they might relate this information to a refinery in operation?

SOLUTION: The answer to all these questions is film, a truly ubiquitous medium which may be used effectively for large or small groups as well as for individualized instruction.

In occupational education, such as the electricity/electronics course mentioned above, complex skills, procedures, concepts, and principles can be clearly observed in an educational film specifically designed to teach the objective. Thus the principles of electron motion or the operation of a manometer can be meaningfully illustrated.

Films can also be used as part of a system of instruction, as in the case of the business students learning to assuage an irate customer. Students may be shown filmed scenarios of a variety of sensitive situations, whether they depict a customer in a store or worried patients and relatives in a hospital. After observing proper interaction techniques the students may practice or role-play similar situations.

Probably the most widely used aspect of film instruction is the medium's traditional ability to bring the world into the classroom. Thus, chemistry students can orient their instruction on petroleum refinement by seeing a "crocking tower" in the field.

Yet another aspect of film instruction is the relative ease with which it may be used for independent learning in on-the-job situations. In this way, students can continue formal learning through independent learning packages which include films and other media, while they gain valuable experience in their job situation.

HOW ELSE DOES FILM ENHANCE LEARNING?

THE FLEXIBLE FILM

Film has been widely used in instruction since the late 1940's. Instructional films vary in length and format. For education purposes, 16mm sound films and super-8 sound and silent films are the most commonly used, the 16mm films for large groups and the super-8 films for small groups or for individualized instruction.

Many super-8 instructional films are designed to present a single idea or a small group of ideas. Such films are called "single concept" films and are usually packaged in continuous-loop cartridges which run from a few seconds to several minutes. Recently, 16mm films have also been reproduced on super-8 sound film and placed in cartridges.

While all these formats tend to have certain characteristics in common (e.g., they are all moving pictures with sound), film is nevertheless a versatile medium. As William Allen has observed, films take on different traits depending on their instructional objectives. In effect, there are six basic types of learning which may be enhanced by the use of film.

They are:

factual information,

visual identification,

principles and concepts,

procedural steps,

skilled motor activities,

and development of attitudes
and opinions.

HOW FILM GETS THE MESSAGE ACROSS

The major instructional advantage of motion pictures stems from their ability to call attention to critical aspects of events. Through production techniques such as editing, sound mixing, titling, animation, and the use of prepared graphic materials, clarification or highlighting of selected elements of a situation may be accomplished. Slow-motion cinematography dissects a complex motion skill, such as a skiing turn or a tennis swing. Photo-micrography combines the film camera with a microscope, giving large audiences access to another world. Time-lapse photography compresses days into minutes so that slowly changing events can be artifically accelerated, for example, the growth patterns of plants. Animation can be used to explain concepts which do not exist in concrete form, such as magnetism or the theory of jet propulsion and flight.

In short, an event may be slowed down, accelerated, reversed, dissected, compressed, or stopped. Events which occur over long periods of time, such as presidential election campaigns, may be filmed, sequenced, and edited together to produce a film which presents the highlights of ten months of campaigning in an hour.

Allen (1971) notes that the "open-ended," problem-setting film has been developing gradually. This format presents either a problem situation requiring solution or the facts, concepts, and observations from which inferences may be drawn. Such films are often integral parts of simulations and games where the participants are required to work out solutions to problem situations as a means of experiencing a process or a particular problem.

Gerlach and Ely (1971) point out:

"Motion pictures bring other people and other nations to the screen. One of the early slogans of one film producer was: 'Bring the world to the classroom.' This is still a valuable contribution of motion pictures."

PROBLEMS WITH FILMS FOR INSTRUCTION

For optimum effectiveness in achieving instructional objectives, a film should be especially made for that goal. However, since most films are produced by a variety of commercial companies serving large general markets, a close match between the instructional goals of a particular course unit and the instructional target of a commercial film is not always possible. Because of the increasing number and variety of films available each year, this situation may soon be alleviated. Of course, the best solution is locally produced films designed to meet specific instructional needs. But production staff and facilities must be available, or the expenses involved may be prohibitive to a small institution.

Gerlach and Ely (1971) contend that most of the limitations of film are of a technical nature and that these limitations are being overcome as films become more accessible and equipment becomes easier to operate. (Gerlach and Ely, 1971) Since films are relatively expensive to produce, it is generally necessary to purchase prints and put them in large libraries which serve several schools in a school system. In the case of a small college or a community college, the acquisition of a large collection of films represents a considerable expense. Usually, a feasible solution to the problem is to rent the desired film for use during specific time periods. However, films may not be available for use when the instructional situation requires them. In addition, the equipment distribution systems which provide the necessary hardware are often needlessly complicated and inefficient, causing dissatisfaction on the part of the user.

WHAT RESEARCH SAYS ABOUT FILM USE AND EFFECTIVENESS

Briggs and his associates (1967) found that studies over a wide range of subject matter, age ranges, abilities, and conditions of use generally showed no significant differences between instruction by films and by conventional methods. Several studies have demonstrated motion picture instruction to be superior to conventional instruction, and a few studies have arrived at the opposite conclusion.

> Briggs also presents studies which show that motion pictures are at least as effective as conventional instruction in teaching factual information and perceptual motor skills. Factual information learned from films appears to be retained at least as well as that learned by conventional methods. (Allen, 1959)

In general, it is apparent from the research evidence that learning from a film can be increased substantially by using various techniques in the instructor's introduction. The following techniques, used where appropriate, are particularly effective:⊛

Directing the viewer's attention to specific points in the film.

Emphasizing the importance to the viewer personally of learning from the film.

Discussing questions and problems pertaining to the film.

Increasing the viewer's anxiety about learning from the film, possibly by relating it to his advancement in the organization, or to his performance or by announcing that he will be tested on what he learned.

The research evidence also demonstrates a decided advantage to film utilization techniques which provide for group discussion and review. The following techniques have been shown to be most effective:

Conducting group discussion of points raised in the film immediately after showing the film.

Combining film discussion with techniques that prepare the group for the film they are to see.

Showing the film again to clarify any questions raised in the discussion.

In general, the user of a film must decide whether or not the additional time needed to discuss the film is warranted by the requirements of the training situation. If he does conduct a discussion, he can confidently expect learning to increase significantly.

It is further apparent that learning from a film can be increased by using various *viewer-participation* techniques. Here are some steps that have proved effective:

Instructing the viewers to *think the answers* to questions that are asked in the film.

Stopping the film and having the viewers answer questions *out loud or to themselves* about the material just presented, then following this up with a short *discussion*, if appropriate.

At the end of the film sequence, having the learners *mentally practice or mentally go over* the material they have just viewed.

Forbidding notetaking during the film. In most cases it will only interfere with learning.

Student *involvement or participation* in the material to be learned is one of the most effective ways to increase that learning. Plan ahead how you are going to use a particular film so that you give the viewer the maximum opportunity to engage in this participative activity.

The evidence in support of *stopping a film* is so conclusive that the technique should be used whenever feasible. Here are some suggestions that can be applied based on the research results:

Analyzing the film and locating the places where it may be stopped and where group discussion might be profitable. Then *planning your use* of the film to build in appropriate trainee activities at these points.

While the film is stopped having the viewers *answer questions*, *discuss material* presented in the preceding sequence, and *review the points* made.

[a] These Guidelines were developed by Allen (1965).

COST CONSIDERATIONS

There are various cost factors to consider when thinking about the use of films in instruction. One is the cost of acquiring a film for use. A 16mm educational film may be rented or purchased. Costs for purchase range from approximately $120 for a ten-minute color film to $500 or more for a one-hour color film. On the other hand, rental rates for one-day usage may range from $10 for the same ten-minute film to $50 for the hour-long film. Some very popular films rent for more than $100 per day.

TOP FILMS OF ALL TIME
I'll take a dozen "Gone with the Winds" Please

An extremely popular or useful film may be rented often during the course of several years. If the number of potential rentals is high, it may be wise to consider purchasing the film. The acquisition of films, and the building of a small film library to house them, also entails storage and maintenance costs, as a certain number of man-hours are necessary to clean, inspect, and repair films. Equipment costs for such an operation may range from several hundred to several thousand dollars, depending on the volume of films requiring inspection.

Projection equipment for 16mm films ranges in price from $500 to $900 per projector. Costs for maintenance, projection lamps, screens, and sound equipment must also be included. Generally, this is included in the budget of the audio-visual center or service.

Presently, tens of thousands of 16mm films and super-8 films are available for rental or purchase from hundreds of sales organizations and rental libraries. (See Resources Section for location of some film rental libraries.) The use of films will be expanded through distribution by open- or closed-circuit television systems or on video tape and video cassettes.

IN SUMMARY

Films are a versatile resource that may be used with a wide range of subject matter, from demonstrations of abstract principles to "bringing the world into the classroom." In all, film may be used to show factual information, visually identifiable features, principles and concepts, procedures in a job or operation, skilled motor acts (such as an athletic maneuver), or propaganda.

> For educational purposes, 16mm and super-8 film are currently used; the super-8 format is used in "single-concept" films.

Production techniques, such as editing, titling, animation, slow- and fast-motion photography, etc., can be used to focus attention on a central idea.

> A significant criticism of film is that a close match between an instructor's educational goal and those presented in a commercially made film are difficult to find.

Research has shown us that use of film can be made more effective when:

> the instructor introduces the film using various techniques such as directing attention and asking questions
>
> group discussion follows the film
>
> viewers are asked to "think" answers to questions, to mentally practice and to otherwise involve themselves in the film's message
>
> the film is stopped to clarify points or to elaborate

Costs are determined by the length of the film to be purchased. Rental charges are often related to the popularity of a film.

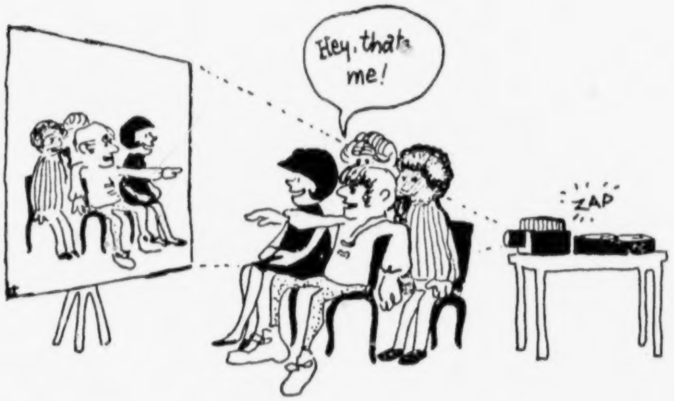
A final word should be added regarding the use of films. When the instructional objectives to be accomplished by the learner have been specified, it is possible to evaluate the effectiveness of a film (or any other media) in achieving those objectives.

Joseph Durzo

LOOK WHAT'S HAPPENED TO FILMSTRIPS AND SLIDES!

Filmstrips and slides have been a popular asset to a wide variety of instructional programs for many years. In fact, it is a rare student or teacher who has not had contact with filmstrips from the very beginning of his educational career.

In community colleges and similar institutions, new uses of slides for instruction have been emerging in the last decade. Multi-projector programs with audio-tape accompaniment are an inexpensive means of presenting affective materials to large or small groups. Of course, these slide-tape presentations may be produced locally, a procedure which requires simple preparation. This enables an instructor to use custom-designed visual information during the lecture presentation.



In addition, commercially produced filmstrips and slides may be used to supplement instructional methods.

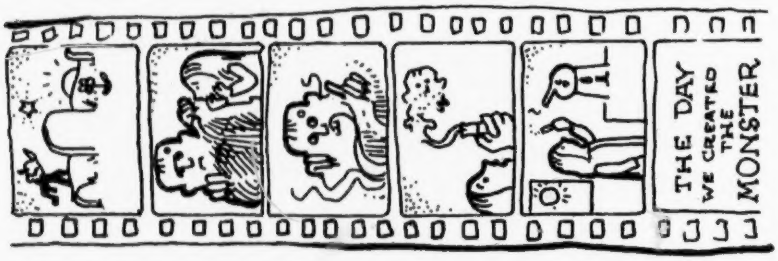
On an individual instruction level, filmstrips and slides, used in conjunction with audio-tape recordings, form a fundamental portion of many auto-tutorial programs. Slides and tape or programmed materials may be combined to teach factual information as well as to give instruction in skills and procedures.

Also, many commercial slide-tape or filmstrip-tape (or record) units are available in a wide range of subjects.

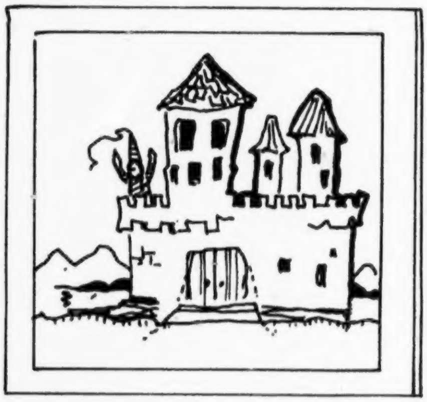
Define your terms...

SOME DEFINITIONS AND EXPLANATIONS

A filmstrip is a length of 35mm film containing a series of color or black-and-white transparencies which are designed to be projected one at a time and in sequential order by means of a special projector.

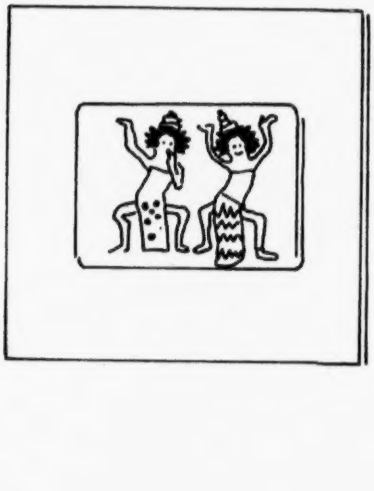


A slide is a single transparency contained in a cardboard or plastic mount which is either 2" x 2" or 2 1/4" x 2 1/4".



Glass 3 1/4" x 4" slides are usually called "lantern slides;" these also require a special projector.

The 2 1/4" x 2 1/4" slides are sometimes referred to as "super slides."



The most common size is the 2" x 2" format which encompasses 35mm and instamatic slides.

Both the 2 1/4" and 2" slide can be projected by a standard slide projector.

FILMSTRIP & SLIDES: SOME PLUSSES/SOME MINUSES

Gerlach and Ely (1971) have pointed out some of the advantages and limitations of filmstrips and slides:

+ + + + + PLUSSES + + + + +

Individual frames can be projected indefinitely on the screen.

The small size of the filmstrip permits easy storage and handling.

Filmstrip and slide projectors are relatively inexpensive, lightweight, small, and easy to operate.

The viewing room need not be extremely dark for projection of slides or filmstrips.

Inaccessible or hard-to-see objects may be photographed and displayed by slides or filmstrips.

The sequence of slides can be altered to meet specific needs.

Slides are easily made with an inexpensive 35mm or instamatic camera.

Copying materials with the same camera is a relatively simple procedure.

- - - - - MINUSES - - - - -

Although careful planning has preceded the production of each commercial filmstrip, the fixed sequence of frames does not permit easy flexibility.

Editing and reorganizing filmstrips are difficult.

Commercial filmstrips lack the attention-compelling qualities of motion pictures and television, which are more familiar to students.

Filmstrips cannot be made easily in the local school, and selection is therefore confined to materials made by commercial procedures.

Individual slides may be lost or put out of sequence, disrupting field programs.

RESEARCH FINDINGS

Classroom studies of filmstrips and slides are relatively scarce. Allen (1959) has stated that filmstrips and slides appear to be at least as effective as motion pictures in teaching factual information. This is probably because they are expecially well suited to individual pacing and student participation.

Most studies are inconclusive and provide little clear data on which the instructional designer may base his decisions. As with films, a wise instructor will review his presentation before showing it and will stop frequently for questions.

A LOW-BUDGET MEDIUM

The costs involved in the use of slides and filmstrips are not very high. Projection equipment for filmstrips range from $25.00 for viewers which can be used by individual students to nearly $300 for sound filmstrip projectors for large-group presentations. Slide projectors range in cost from $30.00 for small manual machines to nearly $250 for the type of machines commonly used for large-group presentations and individualized slide-tape programs. Commercially available filmstrip and slide sets range from $15.00 to $50.00 or more if tapes or records are included.

Production costs for slides vary, depending on existing facilities and the budget practices of the school. If a photography department exists, and expenditures for equipment and staff are already accounted, slides may be produced for as little as 30¢ per slide for the cost of film and processing. However, the same slide might cost as much as $5.00 if shot by a commercial firm. It is important to note that a college photography unit may have as much as $10,000 worth of equipment, thousands of dollars of staff salaries, and thousands of dollars worth of materials in its budget. If a chargeback system exists in order to help pay for the expenses of such a department, the cost per slide will increase dramatically.

Cost of artwork and other graphic materials must also be computed on the same basis. Expenses may range from the cost of the materials used to a charge based on overhead and on the amount of staff time devoted to the production.

IN SUMMARY

Filmstrips and slides are finding new uses in classrooms. Multiple screen presentations for large groups and auto-tutorial programs using slide/audio-tape combinations are possible.

One of the major advantages of the slide medium is low-cost local production.

Filmstrips, on the other hand, cannot easily be made locally. However, much care in preparation of sequences is undertaken by commercial producers.

Research has not offered much guidance in the use and effectiveness of slides or filmstrips.

Paul Elliott

"DIAL ACCESS": APPLICATIONS IN OCCUPATIONAL EDUCATION

A dial access system is a retrieval technique which allows a large variety of instructional messages to be delivered electronically from a central distribution location to any number of student-operated terminals. With such a system, individual students and classroom teachers can select audio or video materials by dialing a programmed digital code or by triggering some form of electronic selection device. Messages are then presented at the carrel, terminal, or classroom through a cable connected to the central distribution center.

Originally, these systems only had an audio capability and used a standard telephone dial and crossbar switching mechanism to deliver the audio signal to the remote locations. Thus they were called "dial access." Actually, a better name would be remote access information retrieval, describing the concept behind the system. Generally speaking, in the hierarchy of technological aids to education, remote access systems would fall somewhere between language laboratories and computer-assisted instruction, being more flexible and disbursed than the former and less sophisticated than the latter.

COMMUNITY COLLEGE USES: A NON-RANDOM APPROACH

It is valuable to note that remote access systems are delivery systems and not instructional devices like programmed instruction. Therefore, their effectiveness and appropriateness largely depend on the software available for occupational education.

Senour (1971) has suggested that 'non-random' remote access systems may be an economical way of supplying audio-visual materials for group instruction.

Oral Roberts University, for example, has pursued this approach with success. Of course, if a school has a random access system, the use of a non-random delivery system for group instruction would be economically infeasible. In occupational education, then, remote access systems may be a viable method of providing cognitive and descriptive materials to groups, freeing the instructor to work on an individual basis with students.

Remote group stations using multiple television monitors could be located in classrooms, workshops, and laboratories. Nursing instructors could call up video tape segments of particular sugical procedures when appropriate. Using video tape, welding instructors could "demonstrate" a procedure to a large group at one time rather than several times to small groups.

On the other hand, if a configuration has random access capabilities, student stations for individual instruction are necessary. Carrels located in a learning resource center may be used by students for auto-tutorial instruction or for review of past or missed lectures.

Individual stations can also be located in shops and laboratories. When a student is about to use a piece of equipment for the first time, he could call up an appropriate demonstration tape from the system. For instance, a secretarial student would have access to dictation drills at various speeds.

A phone tie-in system, designed as a supplement for a continuing education program, would allow absentees to keep up with the work, part-time students to study during lunch hours and evenings, and graduates of the school to keep abreast of changes in their occupational fields.

A FEW TERMS MAY NEED CLARIFICATION

"Random Access" has been used interchangeably with "Remote Access" under the premise that a user may randomly select any program source that he desires. However, in many systems, the first user to sign onto a source will receiver the entire program. All other users will join the program in progress until the presentation is complete and the program recycles. "Random Access" will here refer to the situation in which every user who calls for a program gains access to the entire program from its beginning.

"Audio-active" refers to the remote access hardware configuration in which student carrels have a tape deck to record the student responses along with the master lesson. This system is similar to a language laboratory with remote student stations.

In most remote access installations to date, once a user has called up a program, he must listen to it in its entirety without being able to stop the lesson or to replay portions of it. "Student control" refers to situations in which an individual user can stop and replay portions of the program at will.

HARDWARE CONFIGURATIONS

The general configuration for remote access systems consists of three parts:

a central information storage and retrieval facility

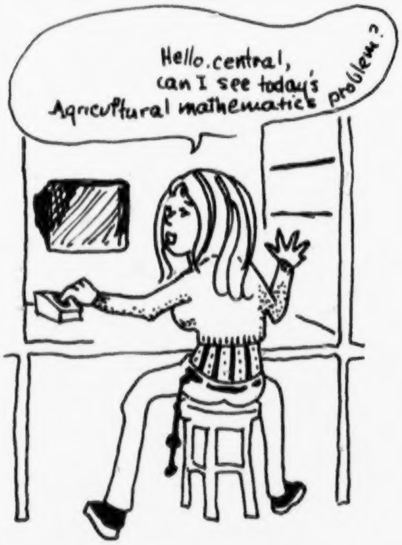
remote user stations for individual carrels or group usage

a means for connecting these points usually a cable of some sort

The information storage and retrieval facility — the most complex and the most costly component — connects the user in his station with his desired program. Although some configurations use human operators, this is generally accomplished by an automated switching/dialing device. Audio-only systems consist of banks of program tape decks. Some of them, using four-track tapes, make four programs available from each deck. In addition, AM-FM receivers can provide inputs. Video systems can accommodate inputs from video tape recorders, film chains (tele-cine), slide chains, live local studio production, and programs transmittted from local educational and commercial broadcasting stations.

Some random access systems have additional capabilities. High-speed audio duplicators can copy tapes on to a student's own tape recorder at the remote station. In other systems, switching and control processes are very sophisticated, requiring a small computer control. Only still video pictures can currently be randomly provided, and the source for these is a bank of video disk units.

The remote user stations may be located in classrooms or student carrels in a learning laboratory. A dial, touch panel, or similar device can be used for program selection. Audio is provided by headphones or speakers with volume controls. For video systems, television monitors are installed in the study area or carrel. In addition to these selection and reception devices, a small number of the more sophisticated random access systems allow the student to control the progress of the program. Some non-random remote access carrels are audio-active, which permits the student to replay the lesson after listening to it first in its entirety.


Hello.central, can I see today's Agricultural mathematics problem?

Usually connections between the central facility and the user stations are cables. Most systems claim to be compatible with the phone system, and some systems have been used extensively with telephones.

SOFTWARE

A remote access system, generally speaking, is simply a tool for storing and delivering information. Such systems do not require that programs be lectures, programmmed instruction, or any other particular format. As a result, any audio or visual material is usable in the remote access system. Interestingly enough, in most cases reported in the literature, much of the software used on a remote access system was locally produced.

EMERGING GUIDELINES FOR ADOPTION

During the early period of their development and use, the rationale for remote access systems was not well thought out. "They began as an outgrowth of the language laboratory which was greatly stimulated by the availability of federal funds in the late 50's." (Ofiesh, 1968) One possible reason for their early popularity was that they were an interesting gadgetry which the government would subsidize and which industry was happy to sell. Of course, explanations were offered — convenience, ease of operation, immediacy, usefulness for independent study, improved lecture quality through recording, etc. — but these reasons could be used as easily to justify other, less expensive equipment. In retrospect, the reasoning behind the expensive, early systems with audio-only capability, no random access, and no student control is difficult to follow.

The technology has progessed, and the earlier limitations have been lessened or removed. Random access audio with full student control is available, and early models of random access video with still images are being installed. Even color video is possible if the dollars are available. With these improvements, is it now a good idea to install a remote access system: That can only be answered on an individual basis after a thorough analysis of the situation.

PLANNING FOR REMOTE ACCESS

If a remote access system is selected for use in an instructional environment, the system must be carefully planned to meet the particular teaching and learning needs of the institution. (The EPIE [1971] and Ofiesh [1968] documents would be informative to administrators who are planning to install a remote access system.)

A consultant to establish technical specifications for the system is advisable.

Faculty involvement during early planning stages will increase the likelihood of a well-planned and well-used system.

Special attention should be paid to year-to-year operational expenses, such as maintenance and operational staff, production and purchase of course materials, and supplies. Many installations have found the money to purchase the equipment but were not able to make full use of it due to lack of personnel and software.

Finally, have a competent individual inspect the system during installation. Plan for delays, and don't make final payment until the system is totally operational.

GENERAL EDUCATIONAL LIMITATIONS: AN ALSO-RAN RECORD OF PERFORMANCE

The performance record of many remote access systems up to this time leaves much to be desired. The problems have been numerous.

audio quality is often poor, and volume controls must be turned up to maximum to hear

video quality is often below broadcast standards due to low-cost recorders; random access video is still developmental; no research exists to show instructional effectiveness of these systems

the technology of these systems is rapidly changing, and almost every system is 'atypical'

operational reliability has been very low, and there have been severe design, maintenance, and operational problems

there have been individual cases where warrantees have been ignored

costs have been high

This list of problems should keep anyone from buying a remote access system withou careful consideration and total planning. However, it should not present individuals from considering the potential of such installations.

With improving technology — the appearance of electronic video recording, the incorporation of student response systems, and similar advancements — remote access systems may be one means of effective education for the future.

RELEVANT RESEARCH

"At present, there does not appear to be any accumulation of quality literature on 'best practices' or mechanical and electronic difficulties encountered with dial access. The question of how dial access relates to other technologies such as ITV and CAI, as well as its effectiveness in meeting educational objectives, needs to be investigaged." (Ingle, 1970) Ofiesh found that only 25 percent of the remote access installations were involved in any evaluation of their systems and only 4 percent were engaged in research. What accounts for this lack of research and evaluation? It may be due to the nature of the system. Remote access systems are primarily delivery systems and should be as "transparent" as possible. That is, they should not be in the user's way. Therefore, the majority of evaluation and research that does take place centers on the lesson materials rather than on the hardware. However, there are a few exceptions.

A survey of usage by Ofiesh (1960) found that remote access systems were used 45 percent of the time for mediated instruction by teachers, 45 percent of the time for cultural enrichment messages, and 10 percent of the time for review. Sabella (1969) found that in one school system's dial access plan — a $250,000 installation with 12 video channels — an average of seven half-hour video programs were used per day during the first full year of operation. That is about 20 minutes of programming per channel per day.

In an experiment which may have implications for usage of random vs. non-random systems (random systems allow for full student control), Senour (1971) compared learning in individuals who had control of the lesson material with those who had no control. Data collected indicated that providing control functions — stop, start, and replay — aids learner achievement.

WHERE IT IS BEING USED: CASE HISTORIES

Most of the remote access systems reported in the literature have both audio and video capabilities; several have random access audio. Ofiesh reports, however, that as of 1968, only one system out of 10 had video capability. The remote access systems reviewed below, therefore, should not be considered as the "average" remote access configuration; rather, they are sizable examples of such devices.

Central Bucks East High School in Pennsylvania has investigated the possibility of incorporating a remote access system into its instructional program. Cost estimates were so high that a decision was reached to use a manual switching procedure. This slows down access time to some extent, but the cost savings made it a desirable alternative. The system has both audio and video capability with 75 user stations, many located in classrooms for group use. In addition to serving as a real-time distribution network for educational and commercial television broadcasts, the system can televise 10 in-house video sources: from 1/2" video tape recorders, two 1" video tape recorders, three 16mm film chains, and one 35mm slide chain. Interestingly, operating expenses have been kept low by using students as machine attendants.

Oral Roberts University has a $500,000 remote access system with video capability which became operational in the fall of 1967. First used for supplemental materials, the decision was made in 1968 to mediate all lectures from several general core courses. Today the system carries a major instructional load with well over half the lectures for core courses presented over the system. The rationale for using the system in this manner has been financial. The faculty now spends its time in ways other than repeating the same lecture to multiple sections.

The bifurcation of the aorta

The Nursing Dial Access System at the University of Wisconsin, which began in September, 1968, was designed as a supplement to a program of continuing professional education. It was designed to reach rural nurses who were somewhat isolated from recent medical developments. The hardware configuration consisted of an in-WATS (wide area telephone service) line with an 800 number which allowed nurses in the state to call toll-free to a manual switching aparatus and audio playback units. The programs were five to eight minutes in length, containing core information about nursing care in emergency situations, new medical procedures and equipment, etc. In operation 24 hours a day, the system received over a thousand calls per month during its first two and a half years of operation.

Other configurations reflect the flexibility of a remote access system. At Oklahoma Christian University there are 850 remote stations — one for each student on campus. Ohio State University has 400 remote stations in 12 buildings. This system handles 40,000 calls per week.

SUMMARY

Dial Access or Remote Access Retrieval is a system which allows instructional messages to be delivered electronically from a central location to any number of student terminals.

The general configuration for remote access systems includes a central information distribution system, remote user stations, and a connection between these two.

An audio or visual material — film, slides, video tapes, etc. — is usable in a remote access system.

Unfortunately, performance of remote access systems is not as good as it can be. Quality of mediated messages is poor; knowledge of effectiveness and correct usage is not forthcoming; most systems are widely different from one another; and costs have been high.

It has been suggested that non-random usage may be most effective for group instruction. Random access is most effective for individualized instruction.

A sampling of case histories has revealed that the remote access system can be applied to a number of formats for different instructional goals.

John Carter

FIRST, A DEFINITION: A PRODUCT/A PROCESS

A review of the literature concerning programmed instruction (PI) reveals at least two quite different definitions. The first, which might be called a "product" definition, views PI materials in terms of their special characteristics. A list of these features would generally include the following: 1) the material must be presented in a series of logically ordered segments or steps, 2) the student must respond to each segment of the material, and 3) the student must receive immediate knowledge of the adequacy of his response. Another characteristic which is more or less implicit in the process is that the student can pace his own progress through the materials.

This definition conforms closely to the one offered by the noted psychologist B. F. Skinner, who gave the initial impetus to the PI movement, following its introduction by Pressey in the post-war years. In attempting to embody his findings from the operant conditioning laboratory into an educational technology, Skinner proposed that teaching machines be used to control the activities of the learner by presenting small segments of material, having the student make an active response to them, and then informing him that he is correct.

In contrast to this definition, the current emphasis on PI views it as a "process for the specification, design, perfection, and validation of instruction." (Porter, 1968) Defined in this way, PI becomes essentially synonymous with the systems approach to instructional development. This approach generally involves prespecifying objectives in behavioral terms, analyzing the sub-skills which must be learned in order to acquire the stated terminal objectives, writing programs to teach these skills and sub-skills, field testing the materials, revising the materials in light of the field testing, field testing further, and again revising the program until the stated objectives are met. The essential characteristic of PI, then, is that it is validated instruction; i.e., it has been shown to achieve the objectives for which it was produced.

The advantage of the "process" definition is that it vastly widens the scope of what can qualify as PI in terms of the media employed, while restricting the term to those products which have demonstrated effectiveness. As Markle (1969) points out:

> "Programmed instruction has been produced in all media. There are validated television courses, validated films, and validated filmstrips--not many, as yet. There are programs in which students cannot go at their own rate, there are others in which no observable activity takes place until the final test, and still others in which no 'right answers' are given to the student at each step...*The consumer cannot tell by looking at the product whether the product is programmed*. The *only* reliable evidence that it is indeed programmed is provided by research data indicating that a group of students could do, after instruction, what the programmer set out to lead them to do."

MISS P.I.
MISS T.V. P.I.
MISS P.I.

Typically, programmed modules or packages fall into two types: *linear* and *branching*. A linear program takes every student through a sequence of steps from beginning to end. Consequently, it makes no allowance for individual differences in knowledge about the subject matter or ability to assimilate information. The steps in the instructional sequence are made small enough to allow students to proceed through the program with a minimum of errors. Ideally, of course, there should be no errors.

In a branching program, errors are not avoided. They are used as a basis for providing remedial instruction through tangential sequences of steps. This allows larger steps to be used and, theoretically, better provides for individual differences. However, the available data do not suggest that branching programs teach any better than linear programs.

PI FOR COMMUNITY COLLEGES

PI can be used either as a primary mode of instruction or as a supplement to regular course work. As a supplement, PI may be useful as a means of providing remedial instruction for students who have difficulty in a group-based setting. Bloom (1968), for instance, has proposed a system whereby deficiencies noted on thorough quizzes and assignments are remediated through some form of individualized instruction before subsequent work is attempted. PI is an ideal medium for this.

Another use of programmed instruction might be to transfer information dissemination from a lecture format to a PI format, freeing the instructor to conduct small group discussions which, hopefully, may increase the quality of student-teacher interaction.

Vocational courses which require drill on essential skills or which require that skills must be learned in a specific sequence are quite amenable to a programmed approach. Shorthand, for instance, has been taught successfully using PI, as have basic electronics courses. (Johnson, 1969) The Armed Forces has made extensive use of PI for vocational and technical courses and is a potential source of programs of this sort. In fact, educational institutions may obtain a copy of many military instructional programs. (See the list of resources for addresses.)

In many cases, significant cost savings can be realized as teachers are freed from routine and clerical duties, allowing them to interact with increased numbers of students. One innovative way to implement this scheme is to employ a master teacher approach in which one teacher and several aides (e.g., advanced students), handle multiple classrooms where students work independently on programmed materials. The responsibility of the master teacher is primarily to develop new teaching materials and to deal with any problems the aides are unable to resolve. Harrisburg Community College in Pennsylvania has used such a plan with success.

GENERAL EDUCATIONAL ADVANTAGES: GUARANTEED RESULTS!

From the very beginning, the proponents of PI have touted its advantages over other instructional approaches. These advantages included time savings, greater levels of learning, and increased flexibility. Unfortunately, the benefits proved nonexistent for many educators who purchased these *product-defined* programs. The reason, of course, was that while the products *appeared* to be programmed -- they contained small segments of material, blanks to be filled in, and immediate feedback, etc. -- they had not undergone the developmental validation process now recognized as essential. Consequently, most early programs failed to meet expectations, and PI lost credibility with many consumers.

The main advantage of well-planned PI is that it is *validated* instruction. In conventional teaching situations a teacher can only *hope* that he is providing instruction which is effective for a large number of students. The wide-scale use of the normal curve for grading purposes is witness to the fact that only a few students learn all that we would like them to learn. Properly developed programmed instruction, used with the appropriate student population and implemented correctly by the users, contains an *implicit guarantee* of effectiveness. This is usually provided in the form of criterion levels of achievement for students which field testing has shown they will demonstrate at the end of the program. *This benefit can only be realized, however, when consumers insist upon and publishers provide evidence that a program meets its objectives*. Materials which are not accompanied by validation data should be viewed skeptically, regardless of the claims made for them.

SATISFACTION
P.I.
GUARANTEED

Another major advantage of PI is its individualized format. Since individuals differ in the rate at which they can learn new materials, *self-pacing* allows slower students to proceed without the danger of being left behind. Self-pacing also allows the brighter student to finish early and spend extra time in other activities. The programmed text offers maximum flexibility in pacing as it can be studied not only at any rate the student chooses but at any time and in any place he desires. On the other hand, a format such as computerized PI offers greater assurance that the student is studying in the way the programmer intended.

Still another advantage of the individualized format is that it allows PI to be used for remedial instruction apart from the normal classroom. Students who encounter difficulty with lecture and textbook presentations might benefit from the more controlled presentation of a programmed text.

In the community college, which large numbers of students are likely to attend on a part-time basis, the flexibility of scheduling which is inherent in the use of individualized programs is a real advantage. When an entire course can be taught using programmed texts, for instance, a student need only make periodic appointments with the instructor for counseling, testing, and other academic requirements. This greatly expands the opportunities for students with unpredictable work schedules or with odd work hours who have difficulty attending regularly scheduled classes.

SOME LIMITATIONS: WATCH OUT FOR COUNTERFEITS

Perhaps the most important limitation on the current general use of PI is the difficulty in obtaining properly developed and tested programs. Of 383 instructional programs for grades 7-12 listed in the Education Product Report (March, 1969), only 20 percent reported any field test data. Obviously, if a school insists on a properly validated product, it has little to choose from. The alternative is local development, which, although possible, is seldom practical since it is quite costly and time

INVALID P.I.
INVA
P.I.

consuming. It is estimated, for instance, that from 50 to 75 hours of a programmer's time are needed to produce one hour of validated instruction. (Markle, 1971) Few local districts have sufficient resources for such an undertaking.

In addition, commercial programs are written for the widest possible audience. A school with special instructional objectives may have difficulty in securing a program which meets its particular needs, even when programs exist in the general subject area. Faced with this dilemma, a school district which still wishes to use PI can either modify its objectives to conform to those of the program or it can supplement the program with other materials or instructional modes which focus on its special needs.

Where properly developed programs can be found, they are likely to be more expensive than their unvalidated counterparts. A school is better advised, however, not to spend its money on wide-based, unvalidated programs if it cannot afford to buy fully tested products.

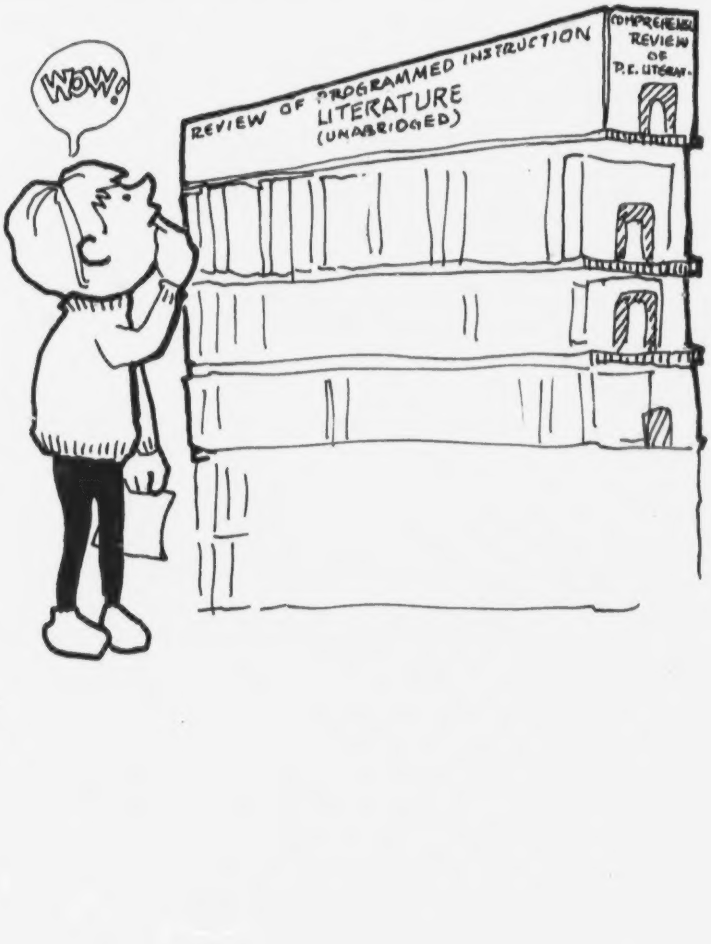
As Gerlach and Ely (1971) point out, PI is more likely to stress the learning of material in the cognitive than in the affective domain. PI may be unacceptable or inadequate, therefore, for the teacher who wishes to stress feelings, attitudes, and values. By nature of the subject matter, though, this may be better taught on an interpersonal basis.

Criticism is often voiced that PI is dull and uninteresting, particularly when a programmed text format is used. One factor which may contribute to this is the redundancy which characterizes most PI. There are sound reasons for this redundancy, however, since what is known as overlearning results specifically from the repetition of what has been learned. Thus, one of the characteristics which makes PI effective in promoting long-term retention may also contribute to its "dullness." On the other hand, even material which is presented redundantly can be interesting.

Instructional designers are becoming increasingly aware of this problem and have begun to incorporate the plea to "make it interesting" into their operating procedures. (Popham, 1971) This is being done through the use of humor, suspense, game-like situations, and the like. In addition, when PI is implemented in a CAI context, where the student and machine may interact, there is a tremendous potential to make the experience a stimulating and exciting one for the student. (The reader is referred to the chapter on the uses of computers in education for a further discussion of these possibilities.)

A RESEARCH ROUNDUP

There are probably few topics of educational concern which have been subjected to more research over the last decade and a half than PI. In 1960, Lumsdaine and Glaser published a comprehensive 724-page resource book entitled Teaching Machines and Programed Instruction which dealt with what had been published on the topic up to that data. In his foreword to the second volume of that series, published in 1965, Lumsdaine estimated that to write another comprehensive review would require a "five-foot shelf."


WOW!
REVIEW OF PROGRAMMED INSTRUCTION LITERATURE (UNABRIDGED)
COMPREHENS. REVIEW OF P.I. LITERAT.

It would certainly require a library to hold all of the published references on PI extant in 1972. Unfortunately, as with most educational matters, our knowledge has grown more slowly than this volume of research would suggest. In fact, much more could be written about what is not known about PI than what is known. Nevertheless, the following is an attempt to summarize some of the major findings.

First, there is no doubt that good PI teaches at least as well, and perhaps better, than other forms of instruction, often with a savings in time. The Naval Air Training Command, for instance, computed time savings at 28 percent after the introduction of PI into their training procedures. (Hitchens, 1971) The same article reported that:

"At Fort Rucker, Alabama, the United States Army Aviation School redesigned the entire Helicopter Instrument Flight Course by converting academic instruction to a programmed format and adopting the technique of programmed, self-paced instruction to flight and synthetic flight training. This design resulted in a significant reduction in course length."

Naturally, whether a particular program will be effective in either learning or time-savings criteria is a matter which must be shown by its field test data. The point here is that these benefits are possible with good programs.

Second, research suggests that individually paced PI generally works best with students who can maintain independent activity for extended periods of time. The student who has difficulty concentrating on a single task for more than a brief period, or who depends heavily upon a teacher for direction and encouragement, may have difficulty completing a self-instruction program. Self-pacing is a virtue for the student who can maintain a steady, albeit slower, pace. This feature is not compatible with the personality of the student who needs much teacher support. It is important, therefore, to match the program's behavioral objectives to a student's level of preparation. A program developed for use with average- or superior-ability students may not function well in a remedial program for low-ability students. The opposite is also true, although for different reasons.

Third, much research has been concerned with the nature of response: whether the student response should be overt or covert, whether there should be small or large steps, whether feedback is necessary and how it functions. These questions are of greater importance to the developer of PI than they are to the user. The interested reader is referred to Anderson (1967) for a thorough review of this literature.

COST CONSIDERATION: YOU GET WHAT YOU PAY FOR

The price of PI materials will largely depend upon the costs associated with its development and the costs associated with the media used to deliver the instruction. Obviously, carefully validated instruction is more expensive to develop than unvalidated instruction, and is therefore higher priced.

Certainly one reason for the many failures of PI in the past is that school systems have purchased programs on the basis of cost alone, without concern for the validated quality of the materials. As Charles Walther, former director of the Learning and Information Systems and now head of Appleton-Century-Crofts, claims, "there is no competitive advantage for a product that offers the buyer proved achievement of certain results for certain students." (1968)

In this statement he is pointing out that in the absence of a demand for validated materials, publishers can successfully market what looks like PI. Until consumers insist upon validated instruction and are willing to pay the associated higher costs, poor programs will continue to be produced and the real benefits of PI will go unrealized. Walther continues, "the publishers will have to respond to discriminating buyers."

The other price variable involves the instructional medium used to present the materials. For instance, Miller (1971) estimated the cost of printed PI at 5¢ to 10¢ per instructional hour, while the cost of computerized PI was put at $2.00 to $25.00 per hour of use. Kiesling (1971), on the other hand, estimated the cost of PI, using a teaching machine costing $1,250 to purchase, at $60.00 per student per year over a 25-year amortization period, and at $200 per year for a CAI system over the same period. Even though the figures vary somewhat, it is clear that as soon as the medium moves from a printed format to films, slides, audio and video tapes, computers, and so on, the costs increase dramatically.

At best, PI will involve no more expense than comparable textbook materials, in which case the cost can be passed on directly to the student as part of his normal textbook budget. On the other hand, it may cost as much as a full-fledged learning laboratory or CAI system. Whether the benefits listed earlier, or the savings associated with better student-teacher ratios, sufficiently offset these financial considerations is a matter for each potential institution or department to decide.

IN SUMMARY

Programmed instruction has been defined as an instructional product which has a series of logically ordered segments, requires an active response by the student, and provides him with immediate knowledge of the correctness of his response. In addition, PI has been given a process definition whereby instruction is specified, designed, perfected, and validated according to a systems approach.

PI can be used as a primary mode of instruction or as a supplement, freeing a teacher's time for guidance and consultation with students.

Well-developed PI offers a degree of guaranteed results. In other words, it is validated in the developmental process. Many commercially produced PI materials are not validated, hence, they are rarely effective.

PI allows self-paced learning and remedial instruction where necessary. It offers students with erratic schedules a chance to be in step with classwork.

Research has shown that PI is as effective as conventional instruction and often saves instruction time. PI works best with students who can maintain independent activity.

Validated PI is often more expensive than non-validated PI, because of production costs. PI shown on electronic media, film or slides is much more expensive than printed PI formats, which are no more expensive than standard textbooks.

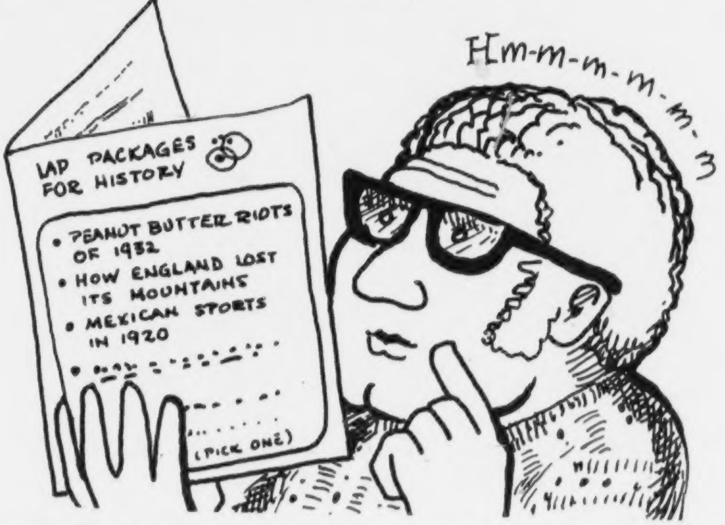
Philip Donoghue

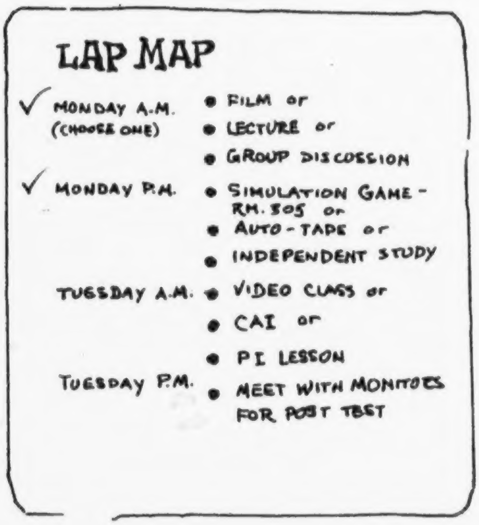
THE LAP SYSTEM: A SMORGASBORD OF INDIVIDUALIZED INSTRUCTION

In the middle 1960's, a new approach to education was developed at the Nova School in Fort Lauderdale, Florida, under the direction of Dr. James Smith. Underlying the new approach was a philosophy of education which emphasized individual instruction and free choice of learning activities. The format called for self-paced learning on an individual basis, packaged in a program which offered the student a selection of various learning activities, including instructional media, PI, and large and small "ad hoc" group interaction. Each package called Learning Activity Packages, or LAP, was designed to bring the learner toward the understanding of a single major concept or subject unit. This was achieved by presenting these concepts in a very carefully planned sequence of activities lasting from two weeks to a month.

Each LAP unit is broken down into secondary units appropriate to understanding the core concept. From the secondary units, behavioral objectives are prepared which are used to evaluate the student's progress as he proceeds from one secondary unit to another. Each behavioral objective, in turn, can be achieved through the use of alternative means of instruction. It is up to the student to select the activity he will engage in as he learns the behavioral objective. This is the significant feature of LAPS learning.

Actually, the Learning Activity Package is only one of the names given to this approach. There are several programs that have been developed independently of each other which incorporate the same process. Two notable ones are Teaching Learning Units (TLU), developed under Project Plan by the American Institute of Research at Palo Alto, and UNIPACS, which the Kettering Foundation has sponsored through Project I/D/E/A. (Edling, 1970) Many similar projects are hypothetical models for organizing learning systems.





LAP MAP

✓ MONDAY A.M. (CHOOSE ONE)	● FILM or ● LECTURE or ● GROUP DISCUSSION
✓ MONDAY P.M.	● SIMULATION GAME - RM. 505 or ● AUTO-TAPE or ● INDEPENDENT STUDY
TUESDAY A.M.	● VIDEO CLASS or ● CAI or ● PI LESSON
TUESDAY P.M.	● MEET WITH MONITORS FOR POST TEST

In the last decade, this type of instructional module has appeared, been tested, revised, and still continue to be developed.

Each package process includes certain elements:

> a rationale or statement to the student indicating where the student has had previous contact with the subject area taught, where the present package will take him, and why he should occupy his time with the idea to be studied (Jones, 1968).
>
> specific objectives, stated in action terms, which the student will demonstrate as an outcome of the learning experience. These also provide a means whereby a student may evaluate his own progress.
>
> a set of directions for the student to follow, including procedures on grading and on how to submit assignments and specifics required for the effective and efficient use of the package.

> a variety of resources — visual aids, bibliographies, work sheets, achievement records, drawings, cartoons, anecdotes, etc. — and activities which are to be selected by the student according to his interest, ability, and style of learning.
>
> a means of evaluation which is built in at several stages, that is, a pre-test, a "checkpoint" test, and a criterion test at the conclusion of the package.
>
> (Syracuse TTT project proposal; 1470-71; Arena, 1970; Unruh, 1970)

The learning package process enables students to learn at their own pace through unique activities. Part of the philosophy states that instruction is built upon and must draw from past experiences and associations. Indeed, life experiences may be more crucial than those encountered in a formal educational setting. Furthermore, the package process requires students to make active, overt responses and performances, a crucial requirement of effective learning. As a result of careful planning, abstract concepts are gradually learned through a hierarchy of prerequisite objectives. No student is thrown into a discipline before he has mastered essential concepts and skills.

Although teachers and educational institutions may feel that they have always operated under most or all of these assumptions, the new approach differs from the assumptions at every step of the process through deliberate planning. The learning activities outlined in the package provide the student with the opportunity for decision-making. This element is critical; for if the student is not provided with alternative routes to the attainment of the learnable idea, then little has been gained beyond the traditional lock-step approach to curriculum. (Jones, 1968)

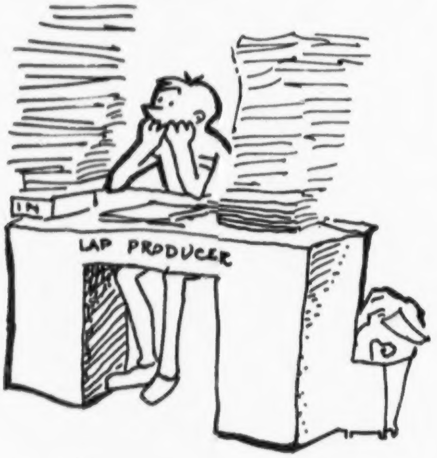
The student's strengths and weaknesses can be made explicit through student-instructor diagnosis, allowing remedial instruction to be more efficient. Not only is student choice of materials and activities made possible, but intelligent monitoring of this choice can explore suggestions for improvement affecting both the individual student and the whole program. (Flanagan, 1967)

In a nutshell, the possible benefits of the LAP program are its capacity to:

> Increase the motivation of student interest through success experiences with the LAP program.
>
> Automatically waive programs covering skills and concepts already mastered.
>
> Bridge the gap between everday life and the releative abstractness of some of the curriculum topics by providing for "real" experiences.
>
> Establish an opportunity for the student to use imagination, problem solving, and creativity in his path through the LAP.
>
> Encourage student responsibility for his own learning through the teaching of a continuous learning process represented by a LAP unit.
>
> (Unruh, 1970)

LIMITATIONS OF THE METHOD

As with any educational method, package programs have their limitations. It is claimed that though the LAP approach is flexible from the viewpoint of the student's activity, the exhaustive, difficult, and time-consuming work of content selection, performance-objective delineation, and package construction imposes a rigid structure upon the curriculum. Any changes in a LAP package may require re-evaluation, rescheduling and a number of other adaptive tasks. Also, the functions inherent in both LAP design and use require a sophisticated and dedicated in-house development staff. Alternately, expensively prepared commercial materials with comprehensive instructions on proper use are available for those systems lacking a staff. Further, certain important affective behaviors may be too subtle to package and measure in standard evaluative procedures. (Flanagan, 1967)



LAP EVALUATION: A COLLECTION OF COMMENTS

Programs have been tried; their establishment continues to receive support. Douglas Brown, Provost Emeritus of Princeton University, says: "the one-way transmission of established facts (that is, conventional procedures) should give way to interactive education with constant, individualized response. This is the way to enhance understanding and sensitivity with respect to values, principles, judgments, and insights." (Chambers, 1970)

One hears as much or more about LAP in use than can be found reported on in the literature. Albert A. Canfield raises the issue of lack of reportage with respect to general instructional innovation. He says, "Although community colleges are primarily laboratories of formal human learning, there is a surprising scarcity of studies of their instructional effectiveness." (Canfield, 1967)

From the research that has been reported, individualized instruction, modules, contracts, and independent study, all have promising results for the improvement of the community college educational setting. It is the community college setting which has attempted to be flexible where universities have been unwilling or unable.

COMMUNITY COLLEGE ADVANTAGES

The LAP format might offer many community colleges the type of flexibility which students need and are coming to expect. This doesn't mean there should never be another lecture, class demonstration, or group discussion. The point is that, for many educational objectives, the unit module is proving more direct, efficient, and effective.

In a community college, a student who has a specific occupational goal toward which he is working for certification, could select only those LAP units for which he has immediate need — a tailored curriculum. This means that if a student is devoting himself to full-time study, he can finish in less than the time that traditional courses require. If he is working and going to school, as many students are, he can feel assured that he is using his time to best advantage, as work process can be incorporated within the LAP.

Under these circumstances, it becomes important that the teachers have time for remedial instruction or guidance. The LAP systems and other similar processes make this time an integral feature of the program.

A MINI-CASE HISTORY COLLECTION

At Pima College, Tucson, Arizona, a system of unit modules has replaced traditional semester courses. In the Pima Program, a student selects those unit modules he needs or desires and, depending on unit length (from one week to as much as a semester), is assigned credit for successful completion. Each student's combination of chosen units represents an entire course. This method allows the student to be highly interdisciplinary and, through the use of branching tracks, to pursue his occupational or vocational goals.

The student registers for only those portions of a branching track which he needs. Work performed in one discipline may result in partial credit at beginning levels of related disciplines; for example, a genetics unit would carry partial credit in beginning psychology, physical anthropology, and general biology. (Lowell, 1971-72)

Another independent study program offers an opportunity for the student to construct his own module "as he goes." North Country Community College, Saranac Lake, New York, has utilized a state program which grants up to 15 credits toward an associate degree or certificate through individual study. In operation, the student submits a petition to do independent work, describing the nature of his intended study. Then the student and a committee of two teachers develop the objectives of the study and the means of evaluating success in achieving these objectives. Essentially, this program is granting credity for what many students are doing anyway, that is, fulfilling interests or engaging in employment either not included in the curriculum or not within the traditional scope of their particular programs. (Milne, 1971-72)

At least one program for teacher in-service training has centered its major instructional thrust on LAP development of social studies concepts. This program is the Syracuse TTT Project, located at Syracuse University, which involves the Syracuse City School District, the East Syracuse-Minoa School District, and the Rochester City School District. (Syracuse TTT Project Proposal, 1970-71) The production of a series of LAPS in the social studies for schools will be one of its major accomplishments.

At Valencia Junior College, every student is encouraged to take part in every stage of a political science course, from the development of the materials and their evaluation to the student's evaluation of his own efforts and the effectiveness of the course. (Leeb, 1970)

At least one conference of junior college teachers has been held at which the teachers were given training in the preparation of a self-instructional package. Five hundred teachers attended the conference; one hundred of those teachers have since produced over 2,000 unit packages. (Johnson, 1971)

IN SUMMARY

Learner Activity Packages, or LAP, is an instructional format which calls for self-paced learning on an individual basis, packaged in a program which offers the student a selection of various learning activities.

Each LAP attempts to teach a single major concept or unit.

LAPS are carefully and systematically prepared. Each unit contains a rationale, specific objectives, directions, resources, and tests for evaluation.

Students may learn at their own pace, frequently meeting with instructors on a one-to-one basis. "Ad hoc" study groups with other students are also possible.

The advantages of the process are that students are motivated, programs can be "custom tailored," real-life experiences can be used for instruction, a student's creativity and imagination are called upon, and the student becomes responsible for his own learning.

LAPS programs and similar systems are difficult to construct, requiring much time and deliberation.

Robert G. Jacobson

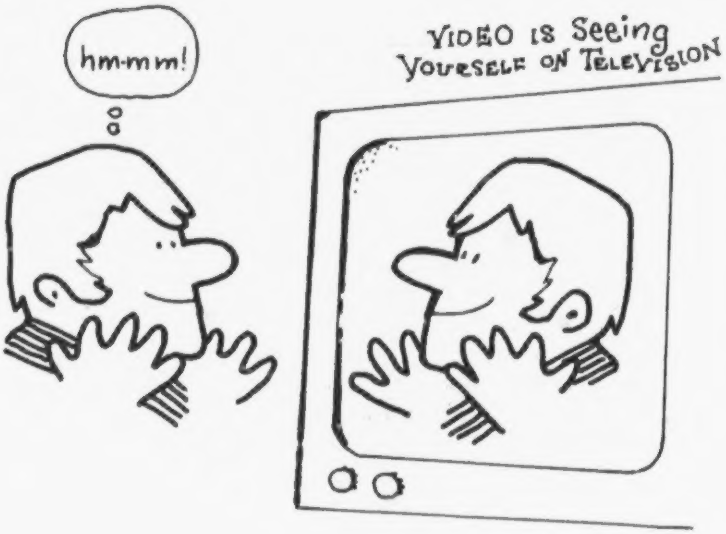
THE VIDEO CASSETTE: A REVOLUTIONARY MEDIUM?

Over the past five years, much talk, interest, and anticipation has been generated about a convenient, simple, and relatively inexpensive innovation in the video-field — the VIDEO CASSETTE. Unfortunately, little more than talk, interest, and anticipation has been effectively marketed by the individual companies developing the cassette systems. In fact, it has been rare for a new product to receive the attention and speculation that accompanied the announcement of video cassette development. Despite announcements of a wide variety of systems to be produced, however, only two magnetic tape systems are being delivered to customers. (Quick & Wolff, September, 1972)

The video cassette system is, of course, very different from standard reel-to-reel VTR equipment. Cassette systems are being developed in many forms, involving magnetic tape in cartridges, super-8 film in cartridges and vinyl discs, and holographic embossed images on clear vinyl. Some systems allow for erasing and re-recording video messages, others do not. In some systems, the cassette cannot be rewound. Playing times range from 12 minutes to two hours. (A summary of the existing types of systems appears below.) The operational concept, however, is quite similar to audio-tape cassettes which have become a powerful teaching tool.

At first, video cassette television would seem to involve mainly a simple packaging change from conventional television. The question is: What does the new packaging style add to present video systems? With regard to cassette impact on communications, comments of interested parties have ranged from the "most radical advance in communications since the printing press" to "much talk and no action." In fact, media mentor Marshall McLuhan has said that video cassettes will upset all political, educational, and commercial establishments. (Quck & Wolff, September, 1972)

While the previews and prototypes have been presented by major manufacturers, few systems have been forthcoming. A major source of difficulty is the competitiveness of the major manufacturers, each one seeking to dominate the market with its system and all unable to agree on compatible tape formats and playback speeds. Of course, since the development of cassette technology is still in a nascent state, any evaluation of an instructional system based on cassette usage would be premature. Speculation can be ventured, however, in terms of the concepts involved.


hm-mm!
VIDEO IS Seeing YOURSELF ON TELEVISION

VIDEO CASSETTE OVERVIEW: STATE OF THE ART

Many varieties of video cassette systems are currently being developed by a number of companies. The list below ⊛ represents the state of the video art as of September, 1972.

SYSTEM	METHOD USED	RECORD	PLAYING TIME IN MINUTES
SONY VIDEOCASSETTE	3/4" tape	Yes	60
CARTRIVISION AVCO CORP.	1/2" tape	Yes	120
RCA SELECTAVISION (MAGNETIC TAPE)	3/4" tape	Yes	60
PANASONIC NV2120	3/4" tape	Yes	60
PANASONIC NV5125	1/2" tape	Yes	30
AMPEX INSTAVIDEO	1/2" tape	Yes	30 or 60
NORELCO VCR	Tape	Yes	60
TELDEC VIDEODISC	PVC disc	No	12
EVR	Special film	No	25 (color) or 50 (b&w)
RCA SELECTAVISION HOLOTAPE	Embossed hologram	No	30
VIDICORD	Super-8 film	No	30
EASTMAN KODAK	Super-8 film	No	22
NORDMENDE COLORVISION	Super-8 film	No	Unknown
JVC	Tape	Yes	60
CONCORD	Tape	Yes	60

⊛ © Quick & Wolff, Small Studio Videotape Production, Addison-Wesley, Reading: 1972.

SOME ADVANTAGES TO THE CASSETTE CONCEPT

Many consumers who did not like to thread reel-to-reel audio systems became converts to tape when the cassette was mass-produced. In a sense, cassette television may share the same surge of popularity. The video cassette is a self-contained, compact, sealed unit. The operator never has to touch the tape in any way. In most systems, the unit is simply inserted in a receptable for playback. Many cassettes are automatically threaded and rewound by the playback instrument, and instant re-plays at any point are possible. In addition, many systems allow for the removal of cassettes at any time during the program. This flexibility is a major advantage over most reel-to-reel tape and film designs.

Portability is another major advantage of the cassette design, offering greater learning possibilities. Recording and playback cassette equipment is generally lighter and smaller than most film and some VTR equipment. In fact, playback units are being developed which are attachable to home television receivers, encouraging use outside the classroom in independent study projects.

Cost will be a major factor in deciding the efficacy of a video cassette system. As with many other video considerations, the economics of cassette television instruction is yet to be resolved. As Ken Komoski, director of EPIE, New York, has commented:

> "At present, the video cassette is not widely used. It is as easy to use as 8mm or 16mm film cartridges. [Yet] a good video system will cost close to $2,500 (including monitor and possibly recording cameras); a film system will cost about $600. Of course, the future holds promise, but at present little can be said about the value of cassette television."

Some systems, it will be pointed out, have a built-in recording capability, a valuable advantage that playback film systems do not have. In fact, to have a "record capability" in a film cartridge system would require the acquisition of motion picture camera, recorders, lights, editing equipment, and sundry accessories associate with film production. For a school system, this represents a major expenditure. The $2500 price for a recording video system is all-inclusive for local production needs, exclusive of optional equipment.

A central question regarding the infulence of cassettes will be its unique role as both a recording and playback instrument.

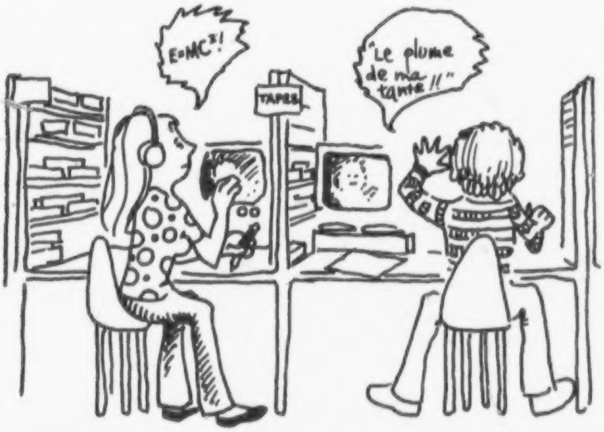
As Charles Tepfer (1972) points out: "To substitute a new video cassette system for the present 16mm projector or VTR is not in the best interests of a school or company unless the cassette device does something that the projector or VTR cannot do.

Of the 15 systems currently under development, nine have recording capability, allowing local production of cassettes for specific purposes. Although open-reel VTR units also allow recording, hence locally produced materials, there are not many pre-recorded, open-reel video tapes availableffrom commercial publishers. The video cassette, on the other hand, is being considered by many educational publishers as an outlet for pre-recorded software. Consequently, the video cassette system has a wider potential than conventional VTR and film systems combined — a recording system as well as a playback system for a potentially limitless array of commercial productions. If this is the case, then a communications change of major proportions is brewing.

VIDEO CASSETTES: THE PROMISE FOR COMMUNITY COLLEGES

As we shall see, the advantages of cassette television — portability, recordability, convenience, and low cost — reveal a number of potential applications in the community college, creating possibiliiies far beyond standard television formats. If local production facilities are or become available (and this can be economically accomplished), the applications of video cassettes are measurably increased over their simple playback potential. The ability to broadcast within school districts is an area of video instruction that is yet to be exploited to its fullest. Most immediately, cassette television will have a formidable influence in classroom instruction.

For instance, the greatest possible impact of cassettes may be in the area of independent study. Students and learning center personnel will find cassette tapes a convenient vehicle for programmed video instruction, for demonstrating remedial concepts or principles, or for presenting factual information, affective messages or cultural enrichment programs. The student in a learning center will be able to play tapes of his own choice, selected from a tape library, at his learning carrel in a classroom or vision receiver. A difficult testing procedure for an automobile engine, for example, can be prepared locally and played over and over again for students as they are performing the task. Some video tapes can also be viewed frame by frame or in slow or fast motion, advantages which are similar to those of film instruction.


E=MC²!
TAPES
"Le plume de ma tante!!"

For affective learning situations, hundreds of role-playing incidents can be conveniently selected and viewed. Students can have the option of reacting on a prepared, written form, on an audio-cassette tape, or on the video cassette itself.

Also, it's feasible to place every film, filmstrip, and other visual in the college system on cassettes, providing a central tape library of the school's media resources.

The portability and recordability advantages of cassette television allow the student to go out in the field and record his own inquiries into his area of interest. An auto mechanic student may visit a cooperating maintenance center and examine, by video tape, exactly how the personnel perform their daily jobs. These valuable impressions can be stored and used as an orientation tool for later groups of students.

In retrospect, the video tape medium is as versatile as the written work, only it uses visual images rather than abstract symbols to convey messages. Students who have difficulty in expressing their thoughts in words will find a much less frustrating outlet in video tape. Indeed, anything that was previously written either as instruction to or reports from students can now be televised quite easily and inexpensively.

HOWEVER, LIMITATIONS HAVE BEEN NOTED

The problem of system incompatibility is a very real one. At present, four companies have agreed on a standard 3/4" magnetic tape. Other consolidation may be forthcoming. This is a positive development for schools. A wise decision for administrators would be to ensure that expensive equipment in a district or region is compatible. This would provide the basis for a software exchange program between institutions.

Also, virtually no evaluation has been done on cassette television systems in educational environments. Most producers are preoccupied with development. And, according to Quick and Wolff (1972), industry and education will pay prime prices for video cassette systems. Once the market is stabilized, hardware prices will drop for the private consumer. Regardless, the value of using cassettes in a classroom or school-wide system is yet to be assessed; and the educator-administrator will be hard pressed to make a buying decision based on research evidence.

Finally, a problem, as yet unresolved, entails marketing and licensing procedures. The entire area of copyright is being litigated in a number of courts, confining current software production to a few film companies that are transferring their own material to cassettes. Some firms, like DuPont, are producing their own training program and selling them to outside interests.

This may signal a new approach to a new field — video publishing. Aside from that development, the question of copyright for various ready-made programs leaves few resources from which to draw. Hopefully, in the next few years, the distribution system of recorded materials will be as stabilized as the emerging hardware systems are becoming.

RESEARCH FINDINGS: ONLY GOOD ADVICE

The lack of any wide use of cassettes tends to preclude research concerned with substantive evaluation results. Aside from comparisons of technical specifications and some conjecture, it seems that the buld of research in this new field remains in the future.

Position-taking and cautionary stances are currently in vogue. Media experts have praised the cassette systems as a:

> "new medium that can revolutionize learning
> by combining instruction and technology."

Tepfer (1972), on the other hand, cautions against moving ahead on:

> "yet another machine that seems to solve all
> the school's education or communications needs"
> [before we]
> "find out what [its] capacility is."

The trend so far in software is to put onto cassettes everything already on 16mm film or video-tape reels. However, the record capability feature of the cassette innovation is what most excites media specialists. This aspect will encourage local production of programs to meet local needs. The possibility of using a device so simple and convenient that individuals can select and create personal programming without great expense seems to be the unique contribution of the cassette. This feature adds new dimensions to the use of television as a teaching tool. Bruce Long summarizes:

> [The video cassette] is an extremely simple audio-video playback device. It can be operated by the learner himself in a lit room at his own pace. It uses a television set which has become the most influential piece of equipment in the average person's life and which conjures up high believability.

?
ALL
YOUR
PROBLE
ARE
SOLVED
WITH
CASSETT

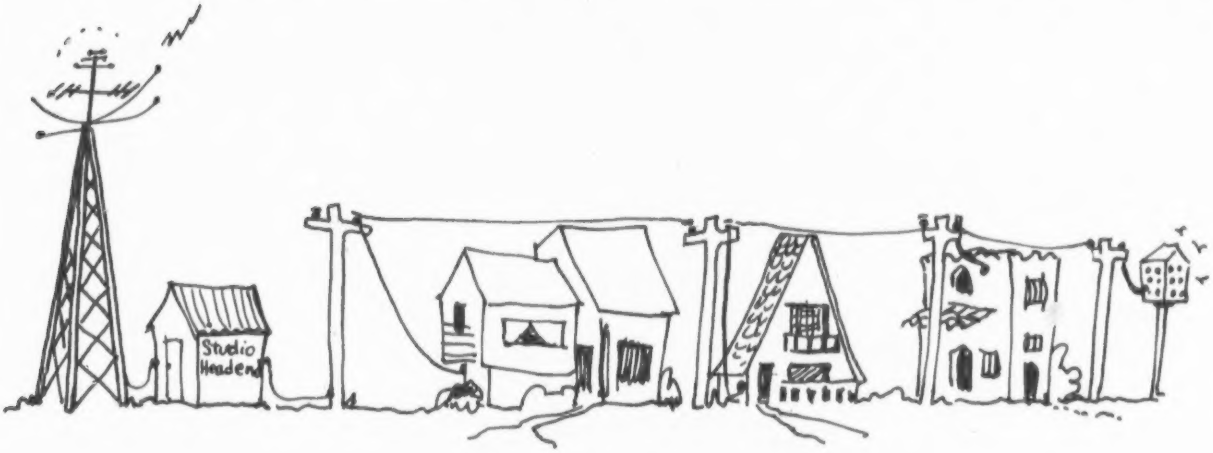
Dennis Carrier

THE CABLE: A NEW LINK TO THE WORLD

By the time video cassettes finally descend in substantial numbers on the public, another new means of disseminating information may already have landed in strength. The system is called CATV, or more popularly, cable television. From what many communications experts are saying, the installation of cable television systems across the country will bring significant changes to the traditional patterns of mass media, changes that will inevitably and, inexorably affect education.

HOW DOES CABLE TELEVISION WORK?

The concept behind cable television is simple. A local cable company erects a large antenna, usually on a prominent elevation. This antenna picks up signals from network and educational television broadcasts. The signals are retransmitted to each subscriber's home by means of a coaxial cable which is strung throughout the community with telephone wires. Local programming directly from the cable TV studios can also be transmitted on the cable.



Originally, cable television was designed to improve reception in poor transmission areas. Its only function was to catch standard broadcast programs and deliver them to consumers. (Wilhelms, 1971) This is known as the supplement stage of CATV development, which began with the first cable system in Lansford, Pennsylvania in 1950.

As cable television progressed, many station managers started to buy, rent, or produce tapes and films to feed into the cable. Some added small production studios and originated their own "live" shows. Little by little these possibilities have become an important attribute of cable television. Eventually this complement stage — furnishing a wider selection of programming — may even culminate in a replacement stage, where importing distant signals will take second place to local origination. (Wilhelms, 1971)

TECHNOLOGICAL POTPOURRI

Cable television is quite different from standard broadcast television. For one thing, the area covered by a single cable company is designated by local government. Large cities, like New York, are divided up to resemble jig saw puzzles, and the component parts are serviced by separate cable companies.

Costs of cable and broadcast television are not comparable. The sophisticated equipment usually found in broadcast studios requires a substantial investment. Cable television production, on the other hand, can use less expensive equipment, even portable television recording units which sell for as little as $1,500.

The initial cable system offered three channels. However, equipment was soon developed which increased the channel capacity to 6, then 12, and by 1968 the Jerold Corporation was advertising a 20-channel system. (Hill, 1968) The coaxial cable is directly responsible for the increased channel capacity of cable TV systems. This cable may, in fact, be able to carry as many as 35 channels. If a cable company supplies two cables to the home or school, 70 channels of television are possible.

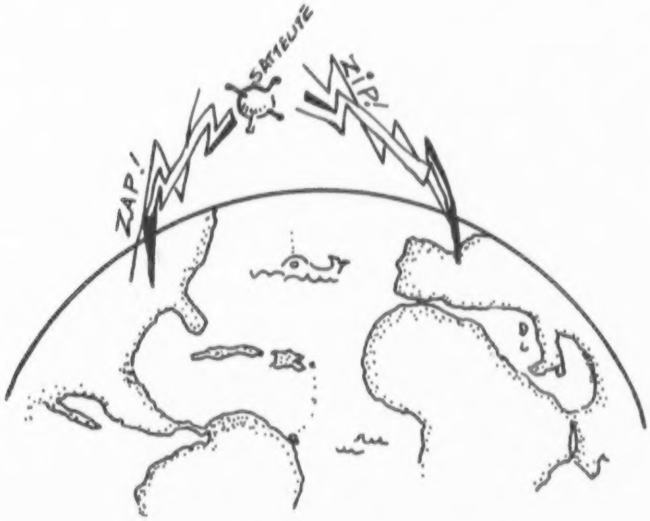
Large numbers of cable operators, mindful of the increased channel capacity, are presently trying to obtain franchises which would permit them to install systems offering a high number of channels. This might indicate that the Sloan Commission's estimate is not as farfetched as many experts believe. The Commission predicted that by 1980 the majority of cable franchises will have a capacity of at least 20 channels, that 40-channel systems will be commonplace, and that even greater capacity may be found in large metropolitan areas. (Sloan, 1971)

Another distinguishing aspect of the coaxial cable is its ability to transmit responses back to the point of origination. These return signals may be video, audio, or digital. The latter return system is presently the most efficient, inexpensive, and easily implemented. It simply consists of a terminal in the home or school capable of answering "yes" or "no" to any given question. The response is then relayed to the head-end where a computer receives and processes the reply in a fraction of a second.

As the cable systems continue to grow in size, the possibility of interconnection between cable systems becomes more attractive and promising. An examination of existing technology by the Sloan Commission revealed that "such interconnection is possible today--and indeed some of it now takes place--by means of micro-wave or cable relay systems." (Sloan, 1971)

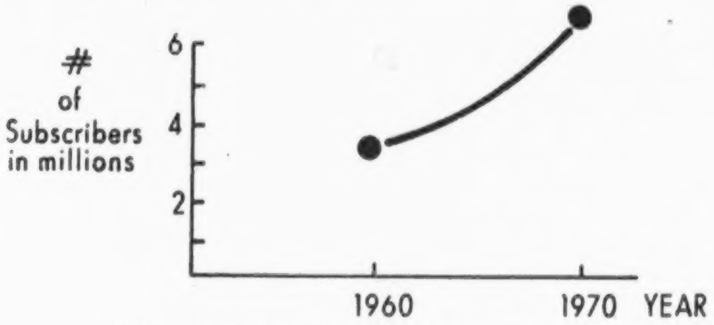
A cable relay system is one in which two localities are connected by a cable. A micro-wave system consists of a receiving station strategically located within the city, usually on the top of a tall office or apartment building. From the receiving station, the signals proceed by wire to each subscriber within the building. Thus, a large portion of the costly expense of laying or stringing cable is eliminated.

Another promising and interesting area of linkage among cable systems is satellite connection. Under this system, a broadcasting earth station would radiate television signals to a satellite. The signals would then be redirected toward earth where they would be received by an antenna and delivered by cable to the subscriber's home. Thus, national and international television would be an instant reality. The implications which this development holds for educators, politicians, businessmen, and others are limited only by man's ability to put the system to work.


ZAP!
SATELLITE
ZIP!

WHEN IS THIS GOING TO HAPPEN?

The Sloan Commission on Cable Communications in its report On the Cable, the Television of Abundance (1971) predicted that by 1980 cable television will reach 40 to 60 percent of the American homes. Irving Kahn of TelePrompter, the largest cable company in the country, anticipates over 85 percent of all television reception in the United States will be on the cable within 10 years. (Castelli, 1971) Today there are already some six million receivers on the cable, serviced by 2,750 distinct cable systems. (Sloan, 1971) In 1960 there were 650,000 subscribers served by 640 systems.



EDUCATORS MUST BE PREPARED TO GET INVOLVED

In a report to the National Academy of Education on the implications of cable television for educational purposes, Michael Molenda (1972) summarizes:

> CATV is likely to have its greatest impact as a tool for deschooling education. By placing a high capacity, multipurpose information channel into the home, it will vastly increase the potential of informal education.
>
> To institutionalized schooling, cable TV promises great efficiency in carrying out the same functions which are performed only sporadically and expensively by existing communications systems. Cable offers broader and more flexible access to educational TV programs, custom-designed ETV programs for specific sub-groups, individual and group access to centralized audio-visual data banks, and two-way communication between instructors and remotely located students via picture, voice, or digital symbols. Each of these can be achieved singly by conventional means, but CATV offers all in one package. The basic infra structure of this system could be provided through entrepreneurial investment rather than through school funds.

> Even assuming the most favorable conditions for the growth of cable TV, it is unrealistic to expect that it will cause any large-scale changes in educational patterns in the near future. The adoption of any instructional technology faces the obstacles of conflict with traditional teacher roles, high costs of hardware acquisition and software development, and the general resistance of an institutionalized system which would have to undergo major structural alterations to use the new technology effectively. In addition, CATV adds a unique problem--the geographical disparities between cable systems and school districts.

LET'S SUPPOSE

SUPPOSE, as Dr. Fred T. Wilhelms puts it (1971), that all of a sudden you no longer had to think of educational television in its traditional one-or-two channel, one-or-two-programs-at-a-time, rigidly scheduled format?

SUPPOSE you had room among the channels so that you could loosen up a bit and do what you wanted to do? Say you have the facilities to continue producing formal instructional programs (ITV). With the cable, you could broaden them to include high school equivalency courses or college equivalency courses for the public, with multiple program choices available at any one time.

SUPPOSE you had enough channels so that you could offer several subjects at once and repeat programs that weren't timed right for your class schedule? Programs could also be recorded off the cable on video cassettes or reel-to-reel video tape recorders.

SUPPOSE that you could add two-way communication into the instructional mix and thus get closer to teaching that operates with feedback?

SUPPOSE you could provide a system whereby students could communicate with local art groups, music groups, public discussion groups, where minority groups or any special interest group could voice messages to the public and to each other? Suppose the "town meeting of the air" or the "school board meeting of the air" became a reality?

SUPPOSE some faculty member has developed an outstanding program--or is wrestling with a tough problem? The rest of the faculty could be in on the two-way communication.

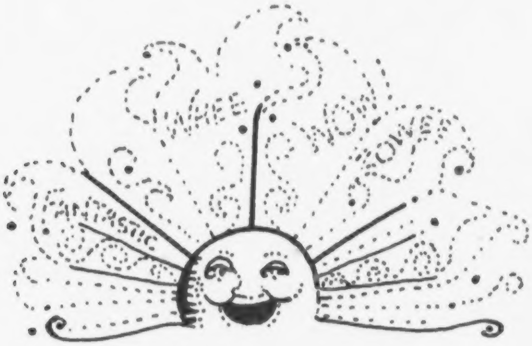
SUPPOSE you could reach homebound or hospitalized students with specialized programs?

SUPPOSE you could have one set of programs at one school or at a cluster of schools and other sets for other schools?

SUPPOSE you could administer instantaneous opinion polls with the student population, the community, or with some special group?

SUPPOSE you could tie closed-circuit uses into the existing framework?

As Dr. Wilhelm continues, there is no need for supposing. All of these suggestions are possible with the hardware available today. A lot more will soon become practicable.



Nothing, of course, could have been further from the minds of the original cable entrepreneurs than the creation of such a revolution. Yet the potential clearly exists because of the intrinsic characteristics of cable; it is a carrier of tremendous capacity. (Smith, 1970)

LIMITATIONS OF CATV

The numerous possibilities of cable television in education are partially offset by some very real and perplexing problems. Such quandaries as regulation, accessibility of channels, production costs, "technological intrusion," and copyright are presently being faced by technologists, lawyers, judges, educators, and cable operators.

For example, CATV's tremendous channel capacity automatically dictates to the producer a series of "do-or-die" standards which must be met. Sharp competition and viewers conditioned to slick network productions add to the problems to be faced by producers in the cable empire.

Further, when CATV becomes widespread, people will select programs because the content is especially interesting or relevant, or the production element is so excellent that the program can be appreciated exclusively for its aesthetic appeal. In other words, viewers will not have to watch a program because "nothing else is on."

With this in mind,
educators should realize that
they must become producers and technologists,
as well as teachers, if they are consistently to
attract a general audience to educational programs.

½" TV is CHeap!
Miss ½" T.V.

Such a development is severely limited since "quality production" is currently synonymous with "high cost." The advent of ½" video equipment, however, may put a dent in many of those costs. Inexpensive video devices, used properly, can produce television images which look and sound very much like high-quality, expensive equipment. In many cases, only television engineers experienced with all types of production could identify the type of equipment used. Poorly planned and produced ½" programs, on the other hand, are just as distracting as poorly planned and produced network productions.

There are several factors which contribute to the high cost of instructional technology. On top of the initial investment in complex equipment, there is the cost of:

(1) Developing and testing high-quality programs.
(2) Providing time for teachers to gain an understanding of the technology, to learn the technical skills necessary, and to plan programs.
(3) Employing media specialists and teacher aides.
(4) Maintaining equipment.

(Commission on Instructional Technology, 1970)

The past decade saw large numbers of educators, administrators, parents, and students retreating from any and all forms of technological innovation. To many,

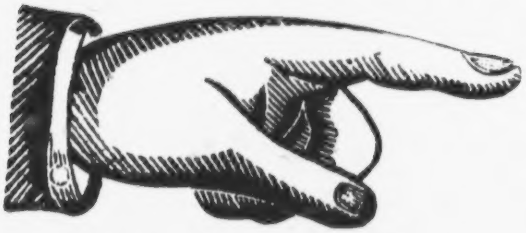
> "the application of technology to something as 'human' as schooling smacks of sacrilege..., especially [to] teachers. Their opposition, or at least ambivalence, may well have been aggravated by overemphasis on mass instruction, machines, and gadgetry, and by the expression 'teaching machine' (now pretty well supplanted by 'programmed instruction')." (Commission on Instructional Technology, 1970)

There is also the fear that the same technology that has polluted our air and water, reduced man to a puppet on an assembly line, and killed hundreds of thousands of people in Southeast Asia, will inflict similar damage upon our educational system.

On the other hand, there are people convinced that the minds capable of creating the ABM system, Apollo spacecrafts, the Wankle rotary engine, and TV dinners, will be able to use the same technological skill and energy to conquer the problems that inevitably follow the invention.

Large CATV corporations, such as Sterling Manhattan Cable Television, Inc. and TelePrompter (serving lower and upper Manhattan respectively), have recently developed a "public-access programming" system which offers cable air-time to individuals and groups (not supported by advertising) for little or no charge. (Price, 1972)

In most cities, however, similar programs have not been developed because of considerations involving the following problems: cost, insufficient amounts of equipment and supervision, and equipment availability.



In a February 1972 ruling, the FCC stated that a public access channel must provide free production for any individuals and groups on a first-come, first-served basis in programs up to five minutes in length. After that, the program originators must pay a fee for production costs.

It is also possible to pre-record a message on rented or leased equipment. To rent the simplest, most inexpensive system would cost about $75.00 per day and $750 per month. Such prices would automatically eliminate a substantial portion of the consumer population.

It is at least conceivable for larger groups and colleges to adopt local production practices, although realistically it is not advisable unless they will be producing programming on a regular and frequent basis. Then "they may find it most economical to invest in tape equipment and to develop production skills themselves." (Price, 1972)

A minimum ½" system costs $1,500 and a basic ½" system with editing costs between $3,170 and $3,520. More complex systems such as a two-camera, ½" system sell for $4,530; a ½" color system with editing runs $5,520; a two-camera,½" color system costs $7,670; a basic 1" system sells for $6,620 and $12,330 equipped with editing, and a two-camera,1" system costs $16,450. (Price, 1972)

Another problem with the emerging cable system is the allocation of channels. According to the FCC, "cable television systems will have to make one dedicated, non-commercial public access channel available without charge on a first-come, first-served basis and...one channel for educational use and another channel for government use.

"Use of the educational channel will be without charge from the time subscriber service is inaugurated until five years after the completion of the system's basic trunk line. After the developmental period, [the FCC] will be in a more informed position to determine in consultation with state and local authorities whether to expand or to curtail the free use of channels for such [educational] purposes." (FCC Ruling, April, 1972)

According to Wilhelms (1971), "it is pretty clear that where education is concerned the Commission is still stuck on the old 'one or two channels for education' theme." In his opinion, although it might be a relief for educators to have the FCC require even one free channel for education, "the system thus provided would be so skimpy that it has almost nothing in common with what is technically possible."

Consequently, the National Education Association has urged that every system set aside at least 20 percent of its channel capacity for public and educational uses. At the present time, many educational interest groups are organized under an umbrella group called PubliCable to influence congressmen, senators, and the FCC on behalf of educational interests. The channel allocation problem is a vast hurdle for the future of educational cable systems; currently, the matter is still in flux. Local cable owners may provide more than one channel if the educational system they are serving can provide the resources. In addition, the FCC has a provision for the leasing of additional channels by any group or individual, schools included.

IN RETROSPECT: EFFECTIVENESS OF TELEVISION INSTRUCTION

Most "studies comparing the effectiveness of televised instruction with face-to-face...instruction by a teacher...show no significant differences between the achievement of students taught over TV and students taught in the conventional manner." (Briggs, 1967)

Further, recent studies of two-way TV (digital, audio, and video) do not indicate that the "talk-back" dimension is any more effective than regular televised instruction or conventional teaching. (Reid, 1967)

A logical question to ask at this point would be:

"What, then, is so unique about cable TV that it is more advantageous than video cassettes, a rear-projected film, or broadcast TV?"

Frankly speaking, cable TV does not have any unique advantage! It does, however, "allow convenient access to many information sources at once and has the capacity for carrying a response signal back to the source." (Molenda, 1972)

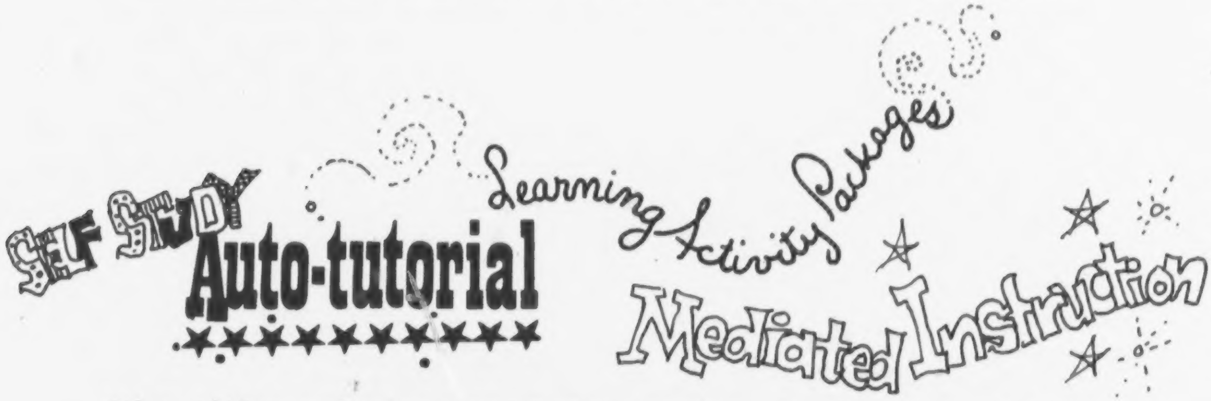
To date, the decision to implement CATV cannot be based upon instructional effectiveness. Consequently, the decision must be made after examining the other possibilities mentioned--observation, continuing education, transmission of ETV programs, program origination, minority and public access, and the like.

Robert Holloway

A GUIDE TO THE DEVELOPMENT OF INDEPENDENT LEARNING LABORATORIES

An independent study program is a complex of complementary concepts. The term has evolved to imply the use of media, new instructional modes for faculty, behavioral objectives, systems, and usually an attempt to individualize instruction by presenting the learner with choices (independent learning being only one alternative). It is clear that a highly structured mastery program without options may be independent but offer virtually no individualization or choice. Individualization is a function of program design. The technical equipage facilitates such goals as efficiency, individualization, and effectiveness, but equipment is not the most important factor. The most important factor is the function of the technology, not the technology itself.

Independent instruction offers powerful benefits when it is successful, and its successes have been heralded under many names:



Other titles emphasize a particular format, such as programmed instruction, computer-assisted instruction, dial access, or computer-managed instruction. They are not used exclusively for independent instruction and may be found in situations involving interaction.

The benefits of independent instruction center around its effectiveness and efficiency. The independent mode releases the instructor from most large-group instruction, since it is basically a one-way process, and enables him to spend more time with individuals and small groups. Because the student usually controls his pace of self-study, he may proceed at a speed commensurate with his ability and may repeat a unit of study as often as needed for mastery.

The student also controls the time when he will undertake the units. Thus he may choose times when he is most alert, receptive, or free from other responsibilities. For on-the-job training and for those individuals who work a full day in addition to training, this is a distinct advantage. However, motivating affective objectives must not be neglected. For instance, Benjamin Bloom suggests a tutor-student relationship as a strategy for dealing with student frustration. Independent study at a community college, for example, should free teachers for guidance and remedial work.

An independent study format can be flexible. Materials, equipment, and models of tools or machinery may be integrated with a programmed instruction booklet of directions or a series of pictorial instructions. Learning by doing is effective and remains an excellent rationale for independent instruction in cases where skills must be practiced to be learned. As Bloom comments, "Some students may learn a particular idea best through concrete illustrations and vivid and clear explanations."

Cost-per-pupil savings are sometimes cited as an advantage of self-study, and, in the long run, they may be. Independent instruction, after initial capital outlay, may be cost-effective, but it is unlikely to be cost-reducing. Its strength is in its capacity to increase instructional effectiveness, not in its ability to reduce strained budgets. This is especially true if any quantity of instructional materials must be produced from scratch or if some of the more sophisticated and costly hardware systems, such as dial access, are used.

GUIDANCE: RESOURCES FOR THE PREPARATION STAGE

Two Caveats

Do not establish facilities as an attempt to solve an existing instructional problem quickly, such as a wide disparity in student entering skills. Less justifiably, don't establish and equip facilities simply because the monies are available, hoping this investment may provide the answer to questions not yet raised. The first is a caution against the "great expectations" syndrome and its concomitant failures so typical of things which are new or different. A program incorporating a structured independent study mode takes time to develop. The second warning is difficult to attend to since no one will admit to spending funds just because they are available.

Programs evolve. They are created not in a genesis of catalytic hardware but in adaptive changes from generation to generation of the program. Massive _a priori_ purchases of hardware usually result in an impressive inventory of under-utilized equipment. A simple maxim is: "Software (materials) before hardware." Equipment which is conceptually valid and educationally desirable will not be of value if no materials are available. While the converse is also true, the problem is not a frequent one. Emphasis on self-study as the _au courant_ and exclusive mode of instruction is to be deplored, comments Henderson in an article entitled "Individualized Instruction: Sweet in Theory, Sour in Practice." The title alone is illustrative of the dichotomy implicit in the problem. _The concept is valid, but the state of the art in terms of implementing the concept is fraught with practical pitfalls_. There are very few maps or models to help chart the way. Those that do tend to be situation-specific and not easily transferable.

The development of the independent instruction mode is still an art rather than a science. The most recent work both in the field and in the literature is exploratory and tentative. In preparing for development, one source which should be used is F. Coit Butler's book, _Instructional Systems Development for Vocational and Technical Training_, Educational Technology Publications. Specific programs which are currently being tested by the New England Resource Center for Occupational Education in Newton, Massachusetts, are documented. Several of the instructional packages are intended for field use and rely heavily on independent study.

A site visit is one of the best ways to get a reality-check on how programs actually function as opposed to how they are purported to function. Two which may be considered are the New York Institute of Technology, Long Island, New York, and Oakland Community College, Auburn Heights, Michigan. NYIT has programs using both computer-assisted instruction (CAI) and computer-managed instruction (CMI). Oakland has established and staffed independent learning facilities in support of the academic skills program. It has also developed technical programs in automative and electrical work which are commercially vended.

Other on-going programs can be identified through the Community College Association of the Association for Educational Communications and Technology. Two 1972 CCA officers are:

President
Dr. George H. Voegel
William Rainey Harper College
Palatine, Illinois 60067
312+359-4200

and

Vice-President (East)
Dr. John Carmichael
Essex Community College
Newark, N.J. 07104
210+621-2200

The Armed Forces have done much of the pioneer work in skills training using structured independent study with multi-media. See the November, 1971, "Training Technology Supplement" to the Educational Technology issue which exemplifies the current approaches in military education establishment.

A number of publications trace the development of community colleges. One of the most recent is The Evolution of the Community College, an unpublished dissertation by Robert Palinchek, Syracuse University, 1972.

PLANNING THE FACILITIES

A clear picture of the target student population and program goals should be described before facilities are designed or modified. Such description of students may give an indication of how many of them will need to be where, for what reason, and at what time. The instructional program dictates strategic needs: an academic program can be highly centralized, learned in a single location, though this may not be preferable, while an occupational program usually is widespread, requiring specialized equipment in a number of separate locations. The mathematics and the remedial English programs may be used by students sitting side by side, but neither is feasible next to the operational requirements of a keypunch machine or drop-forge. A checklist of general categories for an architect's instructions and specifications is outlined in F. Knirk's article on "Learning Space Specifications," Educational Technology, June, 1970.

Academic Facilities

Most academic independent study programs are quiet, sedentary, and clean compared with an occupational program. The materials -- books, tapes, film -- can be used and stored in a common area. The basics for a learning area, according to Kemp in Instructional Design, call for "...independent study stations of a suitable size to hold necessary equipment and study materials while still being comfortable for students, plus the necessary electrical outlets, projection screens, storage areas, and other features."

Such capabilities are frequently built into an institution's library or media center. Syracuse University has established this capability within the campus library. There has also been a trend of establishing facilities in dorms and other locations on campus. Descriptions of instructional materials centers in operation may be found in an annotated bibliography by Horton and Horton in the March, 1970, issue of American Libraries.

Allen Green advocates scattering of independent study units at various locations so they will be more convenient for the user, less monotonous, and nearer teacher spaces to facilitate consultation with students.

Workspace

Green's approach is also practical if no new spaces are available. The back of a room, a lounge, student center, or library may all be used. Quite often there is a tendency to overestimate the amount of space which will be needed in a learning area. Unless the program is scheduled in a time frame, a large number of students may use a small area which at first appeared inadequate. For example, if a course enrolled 200 students and the course work modules were available 12 hours a day, six days a week, the chances are almost zero that the 200 students will be in the facility at any one time. As many as 30 percent of the class using the learning facility at one time could be considered heavy usage.

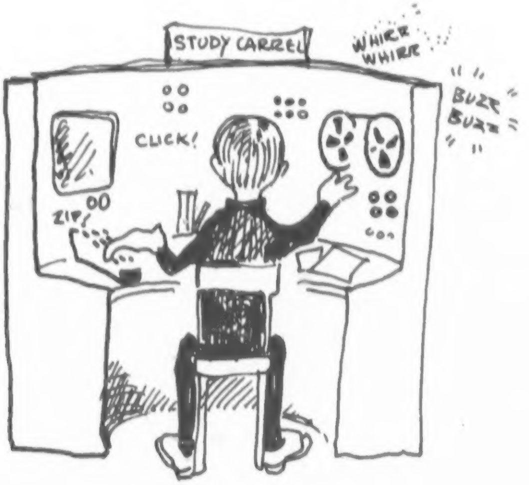
In general, workspaces in an independent learning lab require a carrel or table about 4' wide by 3' deep, or larger, about 20 sq. ft. per station. Most stations, however, require electrical outlets -- three are enough -- while many stations may be nothing more than a table and a chair with adequate light and ventilation.

Conduit for video distribution cables, heavy wiring for multiple AC outlets in each carrel, and other provisions for future additions are desirable.

Furniture

There is a strong tendency, when selecting furniture and hardware, to fill up the work spaces. During the planning stage, this is reinforced by questions such as, "What are you going to put in these spaces?" The implication is that something must be put in the space to justify its existence. In doing so, much flexibility may be lost. Leave an empty space here and there. Some unique program requirement will fill it.

Most types of independent study furniture on the market are varieties of enclosed carrels. However, quite often the enclosure is not necessary. Furthermore, enclosed carrels are expensive, harder to move, and often less flexible work space than tables. Yet tables may be made into carrels if the need arises. Some hardware requires an enclosure which may be desirable for noise control. Generally, however, the requirements would state that the table should be something you can saw and drill with ease, and multiple AC outlets should be provided.



Hardware

Initial investments for independent learning equipment should be conservative. It is difficult to forecast which formats will be most in demand and which equipment will work best in a particular situation. In general, slide projectors are preferred over filmstrip projectors because of the deterioration of a filmstrip after several hundred uses. If visuals are available only on filmstrips, the strip may be cut up and mounted in slide holders. Cassette tapes are preferred over reel tapes because they are easier to handle by the staff and the user. Phonograph records should be recorded on tape, and record players or turntables should not be considered for use unless there are extenuating circumstances.

Film loop projectors are preferred over reel projectors. Several companies are offering endless-loop cartridges which run up to half an hour and have sound capabilities, yet provision should be made for standard format films.

Rear-view projection screens are desirable if funds are available, although there is little reason not to use front projection if there is space. Rear-view projection may be necessary if work space is limited or if there is bright, ambient light.

Sophisticated equipment, such as dial access and demand video retrieval systems, are major investments which require extensive maintenance. The hardware is costly and beyond the capabilities of most technicians to repair. Materials available for use on the most exotic systems are limited and there is usually another way of doing the same thing.

Simple equipment with the potential of multiple-discipline uses is generally adequate. If possible, refrain from large-scale equipment buying decisions until some empirical evidence is available.

Occuptational Facilities

The activities unique to a specific occupational training area are often decentralized because of noise, equipment size, need for supervision, and other such factors. This decentralization should pose no substantive problems to an independent study program.

Workspace

Two kinds of space are usually needed in an operational or shop area. One is a space for learning about the operation, and the other is for carrying out the operation itself. The first is a corner or any small area for media use, materials and tool identification, or other activities. These activities may be part of the operation which must be practiced before the complete operation is undertaken. These may be simulations or mock-up equipment designed to save wear and tear on equipment.

The second space is the operation site itself. This will be specific to each occupational area, requiring some ingenuity on the part of the program developer in adapting each location to independent study needs. Program needs will differ, but consider the needs for electrical power, wall space, and room between stations for media equipment.

Furniture

The furniture for the parts of the program which do not involve equipment operation may be the same as those used in academic areas. If the entire operation is self-contained, such as a typing station, the whole unit may be commercially available as either a stock item or a special order. Install and use a prototype with students and watch for discomfort and operational problems.

Hardware

No occupational area is any harder on equipment than the classroom, and most machines are built for heavy-duty service. Consequently, the same hardware used in academic independent learning areas should be used in operational areas. The Community College Association is in the process of refining a set of two-year college Learning Resources Program Guidelines which may be of some help in determining hardware needs.

Special controls and attachments, such as an automatic slide advance, are usually available as stock items. Check with the Audio Visual Equipment Directory, the vendor, and the manufacturer for listings. These lists will indicate the availability of such items as foot controls for tape decks or projectors, response units, and so on.

FILMED FROM BEST AVAILABLE COPY

UTILIZING SOFTWARE

The wave of development and production of structured program materials for independent study is swelling and has a long way to go before it crests. Software, or program materials, are the key to the success or failure of an independent study unit. Sources and selection of materials, their organization, and the logistics of use are the most time consuming and the most important facets of the program. The breath of life for the hardware is the software.

Sources and Selection

Experienced content personnel in the subject discipline should be the first consulted for names of vendors and titles of software. Through their professional journals, vocational association conferences, and classroom experience, these individuals usually are more aware of resources than anyone else.

Within a specific format, such as computer programs, catalogs and specialized listings may be helpful. The most common mode in structured independent study is printed programmed instruction. The printed program is easy to produce, cheap, simple to use, and easy to revise. One of the best bibliographies of programmed materials is:

Programed Learning: A Bibliography of Programs and Presentation Devices
Carl L. Hendershot, Ed. Publisher
Programed Learning Consultants
4114 Ridgewood Dr.
Bay City, Michigan 48706

Another source, which lists computer-type programs, is:

Entelek, Inc.
Psychological Sciences Division
42 Pleasant St.
Newbury Port, Massachusetts 01950

Comparable efforts have been made to list other materials such as Super-8 films, tapes, and slides, but the results have been mixed. Vendors' catalogs are the best sources for these materials.

Development of a program is not simply a matter of selecting appropriate titles, but a process of previewing, field testing, and evaluation. Toward this end, the American Association of Junior Colleges, working closely with the Educational Resources Information Center (ERIC), a branch of the U.S. Office of Education, has established a clearing house specializing in junior college information located at the University of California, Los Angeles. One of the tasks ERIC has set for itself is the collection of research on instructional processes in the junior college. This type of information may give direction to program development, which in turn will make software selection easier. One existing guide to the establishment of a process is a booklet by Joe Hill, President of Oakland (Michigan) Community College, How Schools Can Apply Systems Analysis, published by Phi Delta Kappa.

The best step in selection is to adapt the materials which seem most appropriate to the discipline. Brief field tests usually point to weaknesses in a presentation, and revision may not be difficult. If no materials are available, the materials may be produced locally. For local productions, the first and usually the least efficient choices are, at present, 16mm film or television. Starting at the other end of the spectrum, the first choice would be simple directions or line drawings. Both elucidating the rationale for the programs and determining the cheapest and simplest method of production are desirable since many projects tend to bog down in budget and production problems.

Slides, tapes, and simulations are also inexpensive and relatively easy to produce and revise. Super-8 film is easy to use, although not easy to revise. Video tape is easy to revise but expensive to produce initially and difficult to use in the independent study mode.

Organization

Once materials have been selected, tested, and found ready for use, some type of system for keeping, cataloging, and scheduling programs is necessary. The larger the school, the more important the organization of a system. The best person to oversee the establishment of such a system is usually a librarian.

This doesn't mean that the materials should be subject to the same checkout procedures as books and that librarians are better at keeping track of things than are most other staff members in a school. The establishment of a processing procedure for materials will ensure, if nothing else, an accurate shelf list. Ideally, the system would keep track of who has how many copies of what, inform faculty of all programs on hand, and maintain a master collection of originals which are not circulated except for duplication.

Cataloging and classifying non-book materials has been a difficult task for librarians because no guidelines existed for many years. Within the last decade, numerous systems have been suggested and far too many implemented. With little adaption, the Library of Congress system can be used for computer printouts or subject classification. For smaller collections, a spiritduplicated, subject cross-listed bibliography of titles will serve to inform faculty. A clerk can keep track of materials with a simple shelf list and checkout card file.

A checkout procedure for students is usually desirable within an area set aside for independent study. This procedure should be handled in much the same manner as a reserve book collection. Loss is highest in formats which have other uses: cassette tapes, slides, and Super-8. Other materials, such as programmed texts, rarely disappear, unless there is test pressure. For the most part, loss of independent study materials is much lower than library materials.

Logistics

The number of copies of a program and how and where it is used are determined by four variables. These are: 1) the number of students, 2) the length of the program, 3) the time between assignment and due date, and 4) the number of programs and options the course has.

Obviously, the more students, the more copies of a program are needed. However, the number of programs does not increase linearly with the number of students. Ten copies may serve 100 students, but 500 students do not necessarily need 50 sets. There are many variables to consider to give absolute numbers of copies needed, but once base-line usage for 100 students has been established for a particular program, an increase of 25 percent of the base figure for each 100 students should be adequate, assuming the students have a choice of times and the materials are available on an extended basis. Lock-step programs are easy to predict. If 30 students are to be in a learning space at 10:30 for a specific lesson, then 30 lessons must be available.

A small class can swamp a learning space if the assignment date and due date for a program do not allow enough time for the students to space themselves out. If a class of 40 is assigned a program on Wednesday and the test is scheduled for Friday, more students will request the program at a specific time than a class of 200 students who have two weeks to do the program.

The first unit in the course will be in heavy demand immediately after the assignment. After students have gone through the first unit or two, they begin to pick times more suited to their individual schedules. Some check points are needed along the way to avoid last minute efforts to do the entire program. In planning the number of copies, then, for a five unit program, the distribution of modules may run something like 10, 8, 6, 6, 8, with an increase toward the end to accommodate the rush before deadline.

From a logistics point of view, options within individualized programs act as safety valves. Options designed as separate units which may be done by the student in any order are a delight. Options which are tracks or sequences of units are second best.

The logistical variables are critical to student acceptance of a program. After all the hardware has been installed and the programs selected, the logistical variables are sometimes left to clerical staff with little to base their planning on.

CONSIDERING ADMINISTRATION FACTORS

Independent learning spaces usually operate with a small number of professional staff. Development and evaluation staff must be professional, but most budgets cannot justify full-time professional staff for day-to-day operation. The units should require minimal supervision in any case, if they are in fact "independent."

A full-time clerical staff provides the attention that programs and students need without the expense of a professional. The primary qualification for this type of staff position is a willingness to help students through the frustrations they encounter.

Budgets and Costs

The cost of the facility space itself, that is, the area and utilities, varies with local construction costs. If existing space is used, the refurbishing costs should be under $5,000 for approximately 100 student stations. This amount includes power and, in academic areas, carpeting.

The furniture and hardware for 100 student stations will cost from $5,000 to $20,000 depending on the mix of hardware at the stations. If all stations have a full complement of hardware, the costs will be at the upper limit. If the mix is low on hardware and if existing tables are modified for use, the costs will be lower. A single station with a full complement of hardware with commercially produced furniture should cost about $440. This figure would be broken down as indicated on the following list. Figures are approximate.

Carrel and chair	$120.00
Projector (Slide or Super-8)	150.00
Tape deck (cassette)	100.00
Rear-projection module	60.00
Headphones	10.00

Special attachments, high-quality headphones, or a larger carrel can easily put the average cost at $500. A station for printed programmed instruction needs no hardware; only the furniture costs, if any, need be calculated. The program materials, or software, by virtue of their formats, determine carrel mix. Typically, multi-use area needs 40 to 60 percent of the carrels equipped with audio playback capabilities. Less than half of the audio stations will need rear-view projection modules. An average of an extra 10 percent of the cassette decks should be purchased for reserve. Breakdown rates on projectors are lower, and 5 percent may be sufficient. Two percent is adequate for slide projectors.

Commercial programs are foreseeable budget items. Prices range from $2.00 for a printed program unit to more than $1,000 for a full course with multi-media sequences. Determining the cost of local development of a program is more difficult, but the amount of budget for a healthy program can be estimated from small pilot projects.

Development cost of locally produced programs is usually expressed as in-school development and not as part of the independent study budget. The total cost is usually hidden, fragmented, and inaccurate in its parts because of record-keeping problems and charge-backs. Local production is the most expensive method of program acquisition, with staff salaries being the main factor in this expense.

Staff for daily operation is a fairly constant and stable factor. Most multi-service areas should be open from 60 to 80 hours a week. This may be done with one full-time clerk and two or three part-time student assistants if the area is open less than 70 hours a week; two clerical persons and one part-time assistant are needed if the learning area is open more than 70 hours.

Professional production, development, and evaluation staff may be estimated as devoting 5 to 10 percent of their time to the independent study budget, but supervisors will spend from 20 to 50 percent.

Many of budgetary needs can be subsumed under existing budget lines. Before new money is sought, existing possibilities should be investigated, since multiple use of staff, such as a clerical person doubling as a secretary, appeals to those responsible for justifying expenditures.

Augustin A. Root

ENHANCING THE LEARNING EXPERIENCE: SOME DESIGNS FOR INSTRUCTION

instruction - an activity for which the desired outcome is learning.

learning - a change in performance ability as a result of experience.

media - a vehicle for transmitting information.

technology - the way in which events are organized to a achieve predicted results.

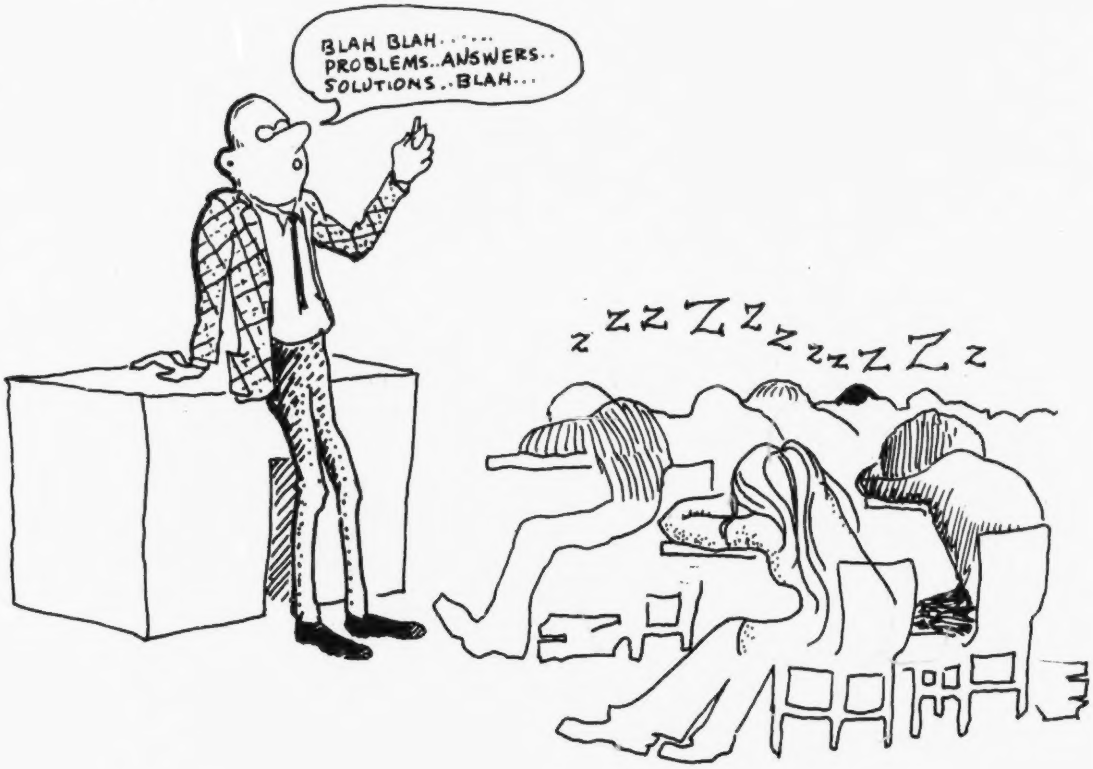
Instructional media is a broad term which includes the words and actions of a live teacher, words printed on a page, still and motion pictures, audio tapes, and objects to be manipulated. The learning stuations within which media are used may be equally varied, from instructor-controlled to learner-controlled activities, from clearly defined to highly ambiguous operating procedures, and from rich and immediate to complete lack of feedback. What is done with media in the total instructional episode is critical.

To illustrate how simple media can be organized in quite different ways, the statements of three instructors have been paraphrased below. All three are experienced teachers. All are regarded as good teachers. All three want help in improving what they are already doing. And, each is already doing some worthwhile things.

INSTRUCTOR #1

"We are using one of hhe best and most widely accepted texts in our field. It is in its fourth edition and has been very carefully worked out. The illustrative problems in the text and the problems at the end of each chapter are excellent. I assign and analyze a chapter each week. Problems are turned in before class on Friday so we can discuss them before going on to the next topic. I work hard to get papers back to the students on Monday morning, but by that time they are no longer particularly interested, and my comments do not seem to help them avoid similar mistakes in the future. They should be better at transferring their problem-solving abilities to new situations. I think I am doing a good job, but I would appreciate your suggestions."

This man is doing a good job, using a traditional and widely accepted approach to problem solving. Still he feels he could improve his students' learning — and he is probably right.


BLAH BLAH......
PROBLEMS..ANSWERS..
SOLUTIONS..BLAH...
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INSTRUCTOR #2

"While textbooks, professional journals, and government reports are valuable resources for my course, they are just not enough. It was not until we began using case studies that students started to dig through the available information on their own to come up with action recommendations. Now they are dealing with the real situations that face professionals in our field. I have invited top professionals in to present their own challenges: a state forester, the local technical librarian, a professional engineer, and others. This has made a real difference to the students; they know that these cases are not just artificial problems made up to illustrate a technical point.

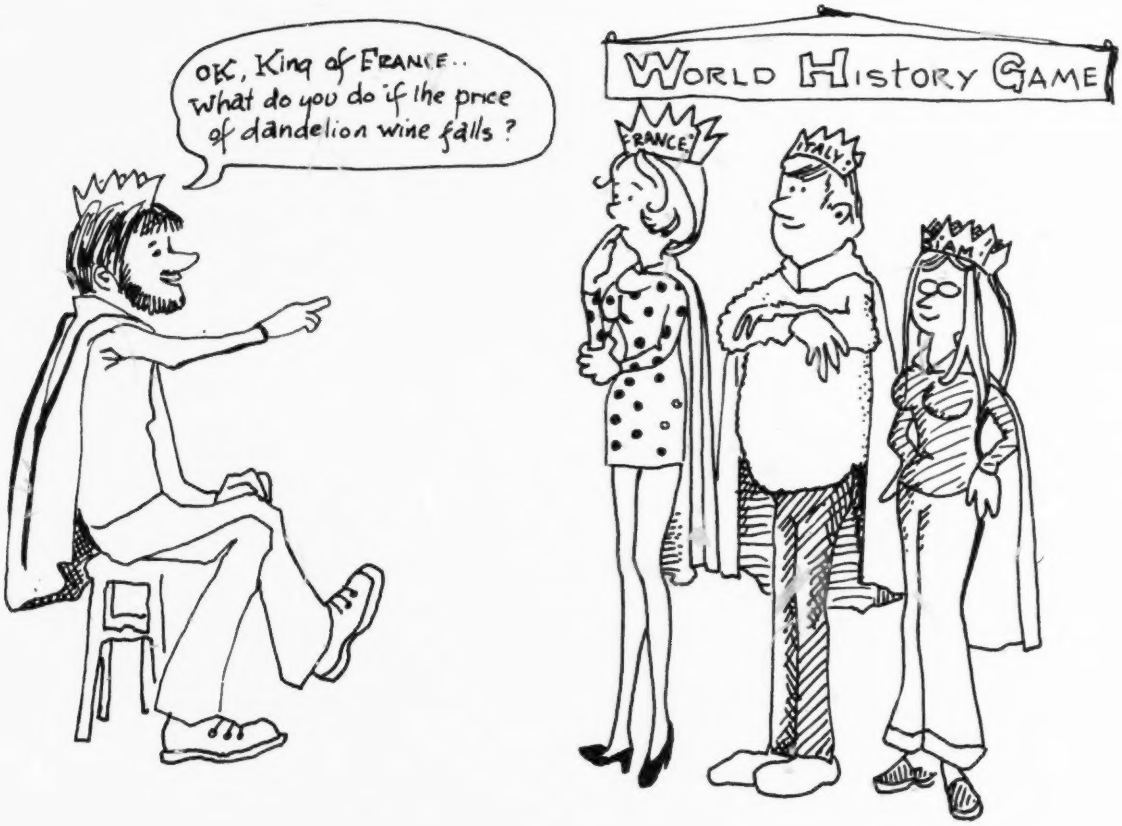
But two things still need to be worked on: 1) how can I get students to take personal responsibility for the actions they recommend, and 2) how can they get more than a superficial understanding of the technical material they read? Some bright and verbal students, merely do a quick review of several sources and put a number of ideas together into an attractive solution without realizing that is just too simplistic and too risky for a competent professional."

He is doing a good job too. He has attended workshops on case-study methods and creative problm solving. He is also perceptive enought to see the limitations in his current approaches. This teacher is ready to consider some variations that could add to the strengths of his present instruction.

INSTRUCTOR #3

"I have been using a number of simulations lately, and they are great! Students get enthusiastically involved in the games I design to illustrate the critical aspects of my courses. My major objectives are for them to realize that any actions that they take will expand certain options for them, and will reduce others. They are getting very sophisticated about entering a new situation; exploring its demands, resources, and risks; and finding the strategy that will optimize their performance under those conditions. While this is a real improvement over last year's apathy, I am worried about two things: 1) I have not yet found a way to develop values that transcend the momentary gains possible in each short-term situation, and 2) I cannot get them to explore and learn from the literature which is available on every topic we cover. In every simulation game, they could improve the quality of their performance from studying what happend in similar situations, in real situations, and in some carefully controlled research studies."

This man's class is exciting to watch: the students seem eager, active, and appreciative. While that is vitally important, the instructor feels that his students need still more. Like the other instructors, he is probably right too.


OK, King of FRANCE.. What do you do if the price of dandelion wine falls?
WORLD HISTORY GAME
FRANCE
ITALY
SIAM

ARE THESE REALLY DIFFERENT METHODS?

On the surface, these three approaches may look quite different. While there are important differences among them, they also have much in common. This section is concerned primarily with suggestions which each of the above instructors can use to improve what he is doing well already. The first instructor focused on technical performance on identified problems, the second paid most attention to the professional's ability to adapt to the complexity of real-life situations, and the third emphasized decision making to optimize performance against certain values. It is proposed here that it is possible to design instructional situations that combine some of the best features of all three approaches. In the following sections, four basic phases of instruction are proposed and ways are suggested in which each phase can be designed to incorporate features of simulation games, case studies, and problem solving.

A FRAMEWORK FOR ANALYSIS

Any instructional experience can be described in terms of four phases:

Introducing the experience,
or setting the stage for learning

Establishing the rules of play,
or providing a set of procedures

Controlling the activities,
or carrying out the experience so
that things happen as intended
(which includes evaluation and
adjustment)

Communicating the results,
or making sure that everyone has all the
information about the activity which he
needs to make future decisions (students,
faculty, administration, and outside
professionals)

The ways in which each of the above instructors _could_ have acted in each of these four phases is described below. When instructors follow this framework, the difference between methods decrease, making it harder to tell whether a class experience is focusing on problem solving, case studies, or simulations.

INTRODUCING THE EXPERIENCE

The introduction to a learning experience could be simple and direct: "This week, we will be going over Chapter 8 in the text. We will do the illustrative problems in class. Turn in the odd-numbered problems at the end of the chapter on Friday before class."

On the other hand, a more complete introduction might include a presentation of the _importance_ of the problem, a demonstration of _competency_ in the topic to be learned, and a display of the _rewards_ available to the learner through acquiring this competency. In any introduction, most instructors hope students know what they are expected to do, and see reasons why they should learn this. Too often responsibility for both insight and motivation are left up to the student. With a little preparation and care, an introduction to a lesson might sound something like this:

> "The design of a bridge can be a fascinating study. New materials and possible shapes open up many creative challenges. At the same time, more difficult and exciting applications are being attempted. Watch this film of the Tacoma Narrows bridge at the time it collapsed. What questions does it raise? What will you want to know about this situation?"

After showing the film (most technical people find it almost breathtaking), the students are given a moment to react to it, then the questions they raise are listed so everyone can see them. The instructor or a visiting professional engineer can provide answers as well as point out certain issues that were not thought of. Often, students do not consider cost, time schedules, working with diverse political groups with varied interests, and coordination with related groups in the community, such as a long-range transportation planning commission.

With this realistic introduction, the instructor presents an example of good professional conduct in the case history, including the steps to be taken, the ways in which each step can be evaluated by a professional, and the kinds of rewards that come along with high-level professional work.

Thus, a complete introduction to any learning experience can include the presentation of three critical factors: 1) the need of which a problem arises, 2) an example of competence, and 3) the rewards or payoffs available through competency.

ESTABLISHING THE RULES OF PLAY

In most simple problem solving situations, students have learned that the"rules of play" are: "Study the materials assigned, talk with others if you want to, solve the assigned problems alone, turn in your work at the appointed time, wait for feedback."

Case studies have a different set of ground rules, usually entailing vigorous interaction with small groups of students and free access to reading materials. Case solutions are often submitted at a fixed time, and feedback is usually provided in group settings where alternative solutions are compared and defended. There is often considerable latitude in case studies as to the procedures that participants can follow, and the rules are usually simple enough to be communicated rather informally.

In simulation games, the required, permitted, and forbidden activities are complex, so most instructors write them out rather carefully, providing a review of the playing rules before starting the activities. In a sense, simulations ask the participant to "play a role." The dimensions of that role are provided by the structure of the simulation, rather than the players' personal understanding and skill as in a case study or a problem-solving situation. The game structure and playing rules define options for action, the resources and limits of each player's environment, and the net gains and losses from various types of interaction with other players and the environment. To optimize his performance of the performance of his group, a player must understand the structure of the relationships among the several players and events; that is, he must learn the way in which his own behavior will be rewarded or punished by players or other agents and the types of power which can be exerted as the various players work out their roles. In contrast to some case-study situations where a player may be rewarded for his ability to empathize with a role and perform that role with considerable expressive skill, simulation games are usually designed to reward instrumental behavior which is effective in reaching goals under the conditions of the game.

For these reasons, the rules of the simulation game need to be explicit, particularly with regard to the structure of the interactions between the players and their environment. It is possible and desirable to define each player's role and rules rather simply, yet to arrange the situation so that success can be reached only through an understanding of some relatively complex relationships between the players and their environment.

These same principles have been applied to simple problem-solving situations with heightened interest and increased learning. One instructor, using a standard textbook approach, modified the ground rules of problem solving so that students exchanged problem solutions with other students, studying and grading them on criteria furnished by the instructor. Part of each student's grade was, therefore, a function of his evaluation of another student's solution. The instructor wanted this exercise to stimulate the professional responsibility one person has for another's performance.

Thus, any learning experience can be enhanced by the preparation of a set of simple ground rules for each participant which leads the student into relatively complex interactions with other students and with the environment. These ground rules spell out activities, time schedules, interactions, and the rewards-punishments available as a function of performance.

CONTROLLING THE ACTIVITIES

Considerable attention has been paid to the "stages" or steps of an idealized approach to problem solving. Although this strategy is supposed to be highly effective, most problem solvers seem to adopt a "heuristic" or trial and error approach rather than an "algorithmic" or logical sequential strategy. Perhaps one reason is that learners get corrective feedback _during_ their trial-and-error behavior.

In programmed instruction, it is possible to provide opportunities for the learner to describe what he _plans_ to do before he does it so that the program can give feedback on strategies as well as on solutions. In case studies, monitoring the process can be done by the participants themselves or by official observers; feedback is provided periodically during the exploration of the case, primarily focusing on which technique is being applied. Simulation games are frequently designed to include a sequence of "rounds," or time periods within which certain decisions or actions must be made. Each round is usually followed by an analysis of the current standings of the players or teams and a discussion of what seems to be happening as the play develops.

A characteristic of simulation games seldom found in other types of learning experiences is the chance for participants to practice the entire sequence of analysis-decision-action-feedback repreatedly during the relatively short period of the game. When an instructor realizes the importance of this cycle of events, he can arrange them in almost any kind of instructional experience. On successive repetitions of this cycle, the structure of the "game play" can become more complex. In a programmed text on engineering dynamics, for instance, the author taught first one method that was applicable when conditions A, B, and C were present, and then taught a second method which was applicable under conditions D, E, and F. The following segment of the programmed text then presented opportunities for students to discriminate between three sets of conditions, asking which method was applicable. This was found to teach an entirely new set of skills — a strategy that included and went beyond the ability to solve a particular kind of problem. A series of case studies can also lead to more complicated skills, depending upon the instructor's ability to identify and to build on the desired performance skills. Similarly, in some simulation games, successive rounds of play provide more complex rules of play and introduce new and more complicated problem situations.

One very practical consideration has become apparent. The instructor must remain active and visible to the participants, rather than leaving students on their own. This is important particularly during the early stages of problems, cases, or simulations. The instructor can provide an important source of feedback during the play of the game, encouraging both activity in the game and learning from the activity.

COMMUNICATING THE RESULTS

After a learning experience, the instructor can provide two quite different types of communication: 1) to the administration for the purpose of influencing possible futures for the student, and 2) to the student for the improvement of performance, interests, and values. The emphasis here will be on the second of these two functions.

Within a learning experience (whether problem solving, case study, or simulation game), feedback information is usually focused on the development of specific performance competencies. The intent of within-experience feedback is the improvement of performance, and therefore the emphasis is on the criteria against which excellence is being judged. When this is true, feedback switches from a personalized evaluation (e.g., good, wrong, "A," or "F") to a pragmatic orientation (e.g., "Let us analyze this solution on the basis of these four criteria.") But there is a need also for the instructor to provide information on the relationship between what went on within the experience and "real-life" events outside the academic setting.

After very simple learning experiences, it is difficult to build on what has been done and relate the events to reality. But when the experience has been introduced with a strong orientation to real-life professional situations with complex rules and reward structures, then it is relatively easy to make this last phase of instruction a meaningful activity.

The goal of this final phase of instruction — communicating results — is that students appraise their own performances relative to the standards of professionalism which the instructor presents and demonstrates. While various kinds of media are appropriate during an instructional experience, this final phase seems best performed through the medium of the live instructor to demonstrate his empathic understanding of the learner's actions and feelings, his own genuine reactions to the learning experience and professional conduct, and his ability to deal with the concrete details of high-level technical competence.

IN SUMMARY

Instructors can learn to design simulation games for their own teaching which will have implications for a wide variety of teaching-learning experiences.

An effective simulation game will include a rich and motivating introduction, a set of ground rules for each player which provides complex interactions within the game, a period of play in which participants practice with frequent feedback, and a final post-game analysis and discussion of the wider implications of the game.

Although there may appear to be superficial differences between simulation games and other types of learning experiences (that is, problem-solving sessions or case studies), these differences appear to be reflected by the degree to which the four functions of instruction are fully implemented. Because of the emphasis which simulation games place on the four functions, the design and use of simulations can be an effective way to analyze and improve general teaching and learning environments.

PART TWO

PROGRAMS OF INTEREST

John Carter

Pervasive Problems: Two Community Colleges with Solutions

What are some of the problems which institutions face after they have acquired technological innovations and begin to implement them? Recently, visits were made at Suffolk County Community College and the State Agricultural and Technical College at Delhi in an attempt to answer this question. Both these institutions had indicated in questionnaires that they used several technologies, such as cable TV, audio and video tapes and computers. These seemed to be representative locations, therefore, to ask about the problems associated with increased usage of instructional technology in the two-year college.

The major problem revealed in these visits can be stated in terms of getting faculty to take advantage of available resources and services for the improvement of instruction. There are several facets to this problem. First, there is the problem of providing faculty members with a _functional_ knowledge of the existence of technological resources and services. A distinction is made here between a _nominal_ and _functional_ knowledge, because it is often the case that faculty members nominally know that resources exist and that there is a unit on campus which "coordinates" something called instructional resources or audio-visual services, but there is no _functional_ knowledge of the implications of those resources and services for their own teaching. A survey at Suffolk Community College, for example, conducted by their Audio-Visual Services Department revealed that even though much of this information was available in the faculty handbook, many faculty members were functionally ignorant of it.

Another face to the problem is that mere knowledge of the existence of these resources is not enough; _the faculty must receive sufficient training in the fundamentals of instructional development to make use of them_. Since the educational background of most instructors at two-year colleges concentrates in their subject matter specialty, there is no reason to expect that they come to the job in possession of instructional development skills. The resultant instructional format is likely to involve a traditional lecture-discussion model. There is a need for faculty to be trained in alternatives, or dominant techniques will continue to prevail out of default rather than reasoned choice.

A solution to the above problems is for the institution to conduct workshops for faculty which acquaint them with available resources and which attempt to teach the fundamentals of instructional development and instructional media utilization. This can provide an opportunity to bring in people from other institutions who have worked successfully with various technologies. In addition, instructors from within the institution who have been innovators in instructional development can discuss their endeavors and provide potential models for others in similar disciplines. Delhi has used this format and found a heightened interest in and commitment to the use of available instructional technology on the part of the faculty.

A third aspect of the problem is the most troublesome. This is the need to create conditions and incentives which facilitate an individual faculty member's attempt to employ instructional innovations. It is one thing to know about the potential instructional advantages of cable TV, audio and video tapes and the like but quite another to do the planning and development necessary to make optimum usage of them. This is particularly true in the two-year college where the typical teaching load is four or five courses. It is difficult under these circumstances to both carry on day to day teaching and advisement responsibilities and at the same time be innovative in the use of technology.

The obvious solution to this is to give faculty released time for course development. This is being tried at Delhi. Individual instructors or groups of instructors are encouraged to submit proposals for course development. If a proposal is accepted, released time and the necessary instructional resources will be allocated to allow the individuals submitting the proposal to implement the plan. Clearly, this sort of institutional commitment is vital if full use of resources is to occur. It makes little sense to spend large sums of money on sophisticated hardware without a sufficient commitment to software development to make that hardware useful to the faculty as a whole. Otherwise, instructional innovation will continue to be done by the few individuals who by virtue of desperation or accident begin to take advantage of these resources despite other commitments.

CENTRAL PIEDMONT COMMUNITY COLLEGE (CPCC)

The Broader Setting

To the visiting businessman, Charlotte, North Carolina has "broken loose." To a local cab driver, Charlotte is "growing every day." To a motel desk clerk, Charlotte has become a "big town." To any observer, Charlotte (and Mecklenburg County) appears to be prosperous and expanding.

These impressions are confirmed by population statistics and economic indices. For example, the greater Charlotte area population has increased 26 per cent since 1963 with the present population of Charlotte at 250,000. Charlotte is the economic and cultural leader of the Carolinas and the hub of the Piedmont -- a broad rolling plateau extending from the Appalachian foothills to the Atlantic coastal plain. It is particularly a regional center in areas of business, health, education, and transportation.

The Specific Setting

In 1963, the North Carolina General Assembly authorized a system of comprehensive community colleges to be established throughout the state in areas of documented need. Central Piedmont Community College was established as a part of this statewide system in July, 1963. The first liberal arts curricula for college transfer were offered in September, 1964. Full accreditation was received from the Southern Association of Colleges and Schools in 1969.

Because of its emphasis on individualizing instruction and the large number of innovative programs created by its faculty members, Central Piedmont Community College was invited to become a member of the "League for Innovation in the Community College," an organization of 15 of the most innovative community colleges in the United States. These pioneering institutions continuously exchange information on projects, techniques, and new materials.

The College has grown from its initial on-campus enrollment of nearly 2,000 in September, 1963 to a September, 1972 enrollment of almost 12,000 students. Recognition of this growth, coupled with an awareness of the prospect for continued development, led the voters of Mecklenburg County to approve in January, 1966 a bond issue of $3 million to assist in financing the first phase of a master plan for campus development. This phase, which included purchase of land, construction of new buildings and renovation of existing buildings, was completed in December 1969. Funds for the second phase were approved by the voters of Mecklenburg County in May, 1970 and two projects made possible by this bond issue, a new classroom building and an addition to the Counseling-Administration Building, were completed in time for the 1972-73 academic year.

The campus, located in downtown Charlotte, North Carolina, is convenient to public transportation and expressway systems serving the greater Charlotte area.

A majority of the students -- ninety-nine percent of the students are from North Carolina with 81 percent from Mecklenburg County -- have an average high school academic record and were attracted to CPCC because it had an open admission policy. Twenty-five percent of the students are enrolled in the college transfer program, 22 percent in general education, 42 percent in technical education, and 11 percent in vocational education. There are approximately 350 full-time instructional staff members at CPCC. Eighty percent are regular members and 20 percent are support personnel. Of the regular faculty, four percent have doctorates, 8 percent have professional degrees, 70 percent have master's degrees, and 18 percent have a bachelor's degree or less as their highest degree.

The liberal arts faculty have the most average education beyond high school (5.0 years), the technical faculty have the next most (4.5 years), and the vocational faculty have the least (2.1 years). All faculty types average at least 5.7 years teaching experience with the liberal arts faculty having the most teaching experience (8.6 years). The vocational and technical faculties, however, have more total years of work experience than the liberal arts faculty.

The Instructional Program

The doors of CPCC are open and accessible to all adults seeking to further their education. The College recognizes its responsibility to the community by providing general services to the surrounding area, by providing opportunities for each student to develop his physical, intellectual, and aesthetic capacities according to his desire to pursue an education, and by assisting each student to attain goals consistent with his needs, interests, and abilities.

Programs of Instruction. The College seeks to implement this philosophy by offering a wide variety of learning opportunities to those seeking instruction or training. These opportunities for learning are organized into five general instructional programs.

1. Trade and Vocational -- This program offers curricula designed to produce skilled craftsmen. The length of time to complete this program is one year or less. Specific programs include: automotive body repair, dental technology, air conditioning and refrigeration, early childhood aide, machinist, medical office technology, nurses aide, practical nursing, welding, vehicle maintenance, clerk-typist, and computer operation.

2. Liberal Arts -- The purpose of this program is to provide curricula in the liberal arts and the pre-professional areas which enable students to enter a four-year institution.

3. Technical and Semi-Professional -- This curricula is intended to enable the graduate to enter an occupation with a marketable skill. Students spend two years in the program. The following areas are included in this program: accounting, business administration, air conditioning and refrigeration technology, chemical technology, commercial art, civil engineering-architectural technology, electronic data processing, dental hygiene, electromechanical engineering technology, mechanical engineering technology, electrical-electronics engineering technology, associate degree nursing, secretarial, police science and criminology, human services associate, and physical therapy assisting.

4. General Education -- This program is designed for persons who want two years of college work for its own sake. Normally, these individuals are not interested in a career-oriented curriculum, and they do not intend to transfer to another college.

5. Extension and Adult Basic Education -- This program is conducted in the community in local institutions such as public schools, community centers, and industries. Emphasis is given to pre-high school courses, high school completion courses, cultural and enrichment courses, and hobby or general interest courses. Opportunities are also provided for vocational training, retaining or upgrading.

Technological Innovation. The innovative vehicle through which educational technology is used at CPCC is the Open Lab. These are areas of space designed to facilitate individualization of instruction. The specific medium used is dependent, in part, on the type of learning activity. Devices such as the audio-cassette, audio notebook, reel to reel tape, single concept film loop, carousel slide projector, sound-on-slide, electronic piano, 16 mm film, or dial access information retrieval system are commonly used.

There are at least 27 instructional areas in which the Open Lab is a major instructional component at CPCC. The area of biology first used the Open Lab as an integral part of its curriculum. The audio-tutorial system implemented by the biology faculty had been developed for a community college in a nearby state. At approximately the same time, several nursing faculty members received a federal grant to attend a summer workshop designed to teach the principles and procedures of the audio-tutorial method in Open Lab settings in nursing education. During the interim between their participation in the summer workshop and the beginning of the fall term, the nurses who had participated in the workshop developed audio-tutorial materials and procedures to be used in the coming academic year. This effort resulted in the development of initial instructional packages which were used in instruction that fall. The staff continued to develop instruction while providing instruction; eventually 77 packages of instruction (each one week in length) were developed in two years. Each audio-tutorial package was designed to individualize instruction after the student was given an overview of the topic in a group lecture session. After receiving individual instruction in the Open Lab, students are quizzed to ascertain whether the objectives of the package had been achieved. Grades of A, B, C, or I (objective incompletely achieved) are given at the end of each week. Students receiving I's are given remedial instruction until they can satisfactorily attain the minimum intended of them in the package.

The development of individualized instruction in other academic areas utilizing media proceeded rapidly. If a proposal for instructional development is of sufficient merit, faculty initiating the proposal are provided released time to develop materials and procedures. The development activity is monitored and evaluated. But, not all developmental activities are successful. The important point is that opportunity is provided to faculty to develop instruction.

The major factor which contributes to the effectiveness of the Open Lab program at CPCC is that the instructional innovations are encouraged and supported by the administrative leadership of the College. All in all, the instructional program could be viewed as a balanced system. By its open door policy, a wide variety of students are attracted to CPCC. Each student is provided an opportunity to obtain initial education or training in almost any field. It goes without saying that an individualized instruction curriculum is the only sensible curriculum, given the characteristics of the student clientele. Furthermore, the encouragement, support, and leadership of the administration, the support services of the Media Instruction Department for preparing instructional materials, the Learning Resource Center, the support and financial backing of the community, the manpower provided to employers, and the general service and dedication of the faculty are necessary ingredients of the successful instructional system.

Not all programs easily lend themselves to use of technology. The areas of instruction that use technological innovation are those in which desired behaviors can be readily objectified. A few examples are accounting, secretarial skills, nursing, mechanics, chemistry, physics, biology, and piano. Areas such as history and English do not lend themselves as readily.

Sample Example

Following is a description of an area in which technological innovations are used in the Open Lab context. In the Auto Mechanic program students are expected to complete four quarters of instruction. After the student gains a working familiarity with the basic engine component, he is instructed by auto-tutorial methods in principles of electricity and in each of the auxiliary engine components (e.g., carburetor, starter motor, alternator, distributor, electrical lights, etc.). A student "logs in" to the Lab and sits at a specially designed carrel in which a starter motor is mounted. The student is presented information about the starter by either a film strip projector and cassette or a sound on slide device. Thus he can disassemble and reassemble the starter, and test its working condition within limits specified. The slides and audiotape used for instruction are prepared by both the course instructor and the staff from the Media Instruction Center. The actual voice of the instructor is used on the recording, as this has been found to personalize the instruction. In fact, "canned" cassette presentations available from commercial developers are frequently re-recorded using the instructor's voice. The student works independently at the task assigned, but if he experiences difficulty, he can consult the instructor who is assigned to the Lab. Upon meeting specified criteria associated with the learning task, the student is assigned another component to work on.

With the other Open Labs, the procedure is similar. For example, experiments in physics are set up at different tables; but before an individual conducts the experiment, he receives instruction about the experiment as well as the desired techniques to be used. Piano instruction, on the other hand, is conducted on electronic pianos. The student receives the sound of his playing through earphones. The instructor has access to any piano being played and can monitor or evaluate progress. This procedure allows for group practice with assistance available from an instructor.

Evaluative Conclusions. Below are some evaluative conclusions based on inquiries with students, staff, and various members of the community. Some conclusions apply to CPCC generally. Others apply more specifically to the technology used in instruction.

1. There is considerable community support for CPCC. There are also no apparent vested interest groups making demands on the College. This could be interpreted as a sign of community support. Another indicator of community support is the extensive attendance by citizens of Mecklenburg County in both the on-campus and off-campus programs of CPCC. The cooperative articulation programs of CPCC with other institutions of higher education is yet another indicator of community support. Another indicator is the support provided by the consumers of the education and training products produced by CPCC. Employers aggressively compete for persons in dentistry, nursing, auto mechanics, accounting, police science, and so on. Finally, the advising of many graduating secondary school students by teachers and counselors in Charlotte to attend CPCC is evidence of support.

2. The increased attendance of students attending CPCC along with a decreased attrition rate are suggestive of the value students place on CPCC. Most students view the open admission policy of CPCC as the most important feature of the institution. Secondly, they value the individualization of the curricula. Finally, they value the diversity and flexibility of the curricula -- from liberal arts to technical education. There are criticisms, too. The primary one is that the individualization provided

by the use of technological devices decreases personal contact between students and teachers. This criticism is voiced by students who have had limited academic success prior to enrolling at CPCC.

3. To many of the instructional staff, the active participation of the learner in his learning is highly valued. Secondly, that responsibility for learning is placed on the learner is yet another positive aspect of the program. Finally, benefits to staff from involvement in development activities were frequently mentioned as being desirable.

4. The cost of the individualization is viewed by some administrators to be greater than conventional programs. But, amortization of initial equipment costs might reduce program costs to an equivalent level of cost as traditional program costs.

Franklin Wilbur

Oakland Community College:
Following the Media Road on a Cognitive Map

Oakland Community College (OCC) near Detroit, Michigan, consists of four campuses and an administrative center located within Oakland County. The general purpose of its instructional programs is to prepare students for a career field immediately following graduation or to continue their education at a four year college or university for the baccalaureate degree. Because of its "open-door" admissions policy, which has brought in a large student population, a number of innovative uses of instructional technology and instructional approaches have been developed at OCC to facilitate student achievement.

Oakland Community College's philosophy is that if less than 90 percent of its students succeed, then it is the college -- not the students -- which has failed. Oakland's individualized approach to learning is based on the idea that a student will not fail if course content is presented according to the individual's *cognitive style*. OCC has defined cognitive style as the total way an individual searches for meaning in or perceives his environment. Preference for reading or listening, different methods of categorizing, encoding and decoding information, choice of group or individual study, and the ability to emphathize with other points of view are examples of cognitive style variables. Elements of cognitive styles are measured by scores achieved on written diagnostic tests, performance demonstrations and personal interviews. This information, with the help of a computer, is translated into a *cognitive style map* which is used to help faculty members plan what is called a Personalized Education Program (PEP) for each student. From the cognitive style map printout, an instructor can determine, for example, which students learn well from TV, audiotape, textbooks, lectures, independent study, etc. In other words, Oakland's position is that different instructional devices and situations can be used to ensure success for *certain* students while none is most effective for *every* student. *The utilization of the media and method properly matched to the cognitive style of the learner becomes the central focus of instructional design at OCC*.

Prescriptions for personalized instruction could included the use of programmed instruction, simulators, lectures, seminars, TV, or tutoring. Students may use any one of these or other modes of instruction in addition to regular scheduled classes. The environments for these other activities are the individualized programmed learning laboratory, the carrel arcades, and the learning resources centers.

Individualized Programmed Learning Laboratory (IPLL)

Here students can work independently utilizing programmed materials, specially prepared lesson packages, three dimensional models, and audiovisual equipment. Students work under the supervision of four faculty members who are specially trained in individualized instruction techniques and who are competent in basic academic areas. These faculty do not teach outside classes. Their full-time responsibility is to tutor students in all major curricular areas and study skills, to administer and evaluate diagnostic tests, to prescribe and assist students in the use of instructional materials, and to monitor the progress of all students using the facility. The IPLL provides students with highly personalized, self-paced, and convenient ways of meeting a number of instructional, remedial, and enrichment needs. A general consensus at OCC is that faculty contact is essential to maximize the effectiveness of students using programmed materials. A librarian at Oakland's Orchard Ridge Campus reported, "Students who are having academic difficulty, older students who feel awkward after being out of school for many years, students with reading disabilities, and students who enjoy learning outside the traditional classroom find the extra help and the low pressure atmosphere in the IPLL a way to success."

Carrel Arcades (CA)

The carrel arcades are large, open areas for relaxed independent study, small group discussions, and tutoral sessions. Faculty members design activities for these carrels which complement traditional classroom procedures. Students can meet in informal sessions with their instructors and other students. In addition, the carrel arcades are the setting of the youth-tutor-youth (YTY) program which makes student help available to other students on a regular basis. Students can review videotaped lectures, listen to recordings on discs or audio tape, and study other course materials. Paraprofessionals assist the faculty in providing the student with a variety of services, settings, and technology to facilitate learning. Carrel arcades have been designed for use with programs in electronics, automotives, climate control systems, as well as basic academic areas such as biology, mathematics, English, psychology, history, and the social sciences.

Learning Resource Centers (LRC)

In addition to providing traditional library services, the learning resource center acts as a clearinghouse for a variety of instructional packages including microfilms, special displays, and research materials in many forms. Each LRC has several staff librarians and library aids who assist students with research problems and independent projects. This center provides still another way a student can pursue learning according to his own personal style.

All three types of faculities — individualized programmed learning laboratory, carrel arcades, and the learning resource center are located on each campus, and each contributes to the total concept of PEP (personalized education program). Production of instructional materials used at these locations and in the classroom is handled by a center for instructional technology. This department is staffed by video, audio, photographic, and general hardware specialists. Student assistants are paid to distribute and operate the equipment throughout the campuses.

The Curriculum

At Oakland Community College, programs in the vocational and occupational areas are grouped under the title, "Applied Science and Arts." Oakland's Applied Science and Arts programs offer a wide range of occupational choices under seven broad clusters.

The following lists provide breakdown of programs within each of the seven major cluster groups under Applied Sciences and Arts.

Business Sciences

Accounting
Assessment Administration
Retailing
Real Estate
Clerical Assistant
Conference/Court Reporting
Executive Secretarial
Legal Secretarial
Stenography (one year)
Management Development

Computer Sciences

Software Programming
Information Systems
Computer Sales Engineer
Educational Research
Teaching

Engineering Technology

Automotive Technology
Electronics Technology
Drafting Technology (one year)
Mechanical Design Technology
Mechanical Production Technology

Home and Personal Services

Commercial Cooling and Baking (one year)
Food Service Management
Hotel-Motel Management

Public Service Sciences

Audiovisual Technology
Landscape Technology
Library Technical Assistance
Law Enforcement Technology
Retail Security
Industrial Security

Health Sciences

Dental Assisting (one year)
Medical Laboratory Technology
Nursing (ADN)
Nursing (PN)-MDTA

Industrial Sciences (partial listing)

Apprenticeship (21 programs)
Pre-Apprenticeship Training
Climate Control Systems
Air Conditioning
Refrigeration
Heating
Diesel Engines and Transmissions
Numerical Control
Plastics
Employees-In-Training (35 programs)

The Industrial Sciences cluster provides an example of innovative uses of instructional materials and technology. During the past several years, the faculty have worked closely with representatives of the Xerox Corporation in designing a series of learning packages for teaching basic first semester courses. These packages, known as the "Occupational Technology Series," cover many topics in automotive technology, climate control systems, and electronics programs at Oakland. Examples are given below:

Automotive Technology

Overview of Automotive Industry
Automotive Trouble Shooting
Tune-up Procedures
Safety in an Auto Shop
Transmission, Drive Shaft, and Axle Operation
Basic Physical Principles
Electrical Systems Fundamentals

Climate Control Systems

Refrigeration Cycle
Heating Systems
Refrigeration Components
Refrigerants
Wiring Diagrams and Controls Installation and Maintenance

Electronics

Overview of Electronic Industry
Basic Tools
Electrical Components
Electrical Circuits
Basic Measurements
Multi-meters
Magnetism and Induction
Generators and Motors

Each program in the series consists of an audiovisual presentation, a simulator, and various student materials. The audiovisual presentation serves to actively involve the students in working with three dimensional models, manipulating electrical components, designing blueprints of refrigeration units, and the like. A student manual and other materials give step-by-step instructions and provide frequent evaluation exercises. The student is continually active and involved, and the teacher is free to work with students individually when they require additional help. Instead of textbooks, the units are used as either out of class exercises, remedial material, or enrichment or optional lessons. Evaluation instruments have been developed which continually monitor the effectiveness of all instructional materials, providing information necessary for update and redesign. Some other companies producing materials used in Oakland's Industrial Science program are the Whirlpool Corporation and the Philco Corporation.

Programs created within the Applied Science and Arts area are developed systematically. The Industrial Science program, for example, has formed an Apprentice Advisory Committee composed of instructors from Oakland and representatives from industry. This committee advises the faculty on curriculum revision. This input plus information on entry skills, prerequisite behaviors, terminal skills, and cognitive style data assist the faculty in prescribing and designing programs of study.

Recently Oakland's Orchard Ridge Campus formed an organization called the Center for Instructional Development. This organization has representatives from all academic areas and considers the funding and selection of new instructional development projects on the campus.

For further information concerning OCC's programs, contact the individuals listed below.

Cognitive Style Mapping, contact Dr. Joseph E. Hill, President

Personalized Education Programs (PEP) and Individualized Programmed Learning Laboratory (IPLL), contact Dr. Derek N. Nunney, Vice-President

Carrel Arcades, contact Dr. Virginia Savage, Director Learning Systems

Applied Science and Arts Program, contact Mr. James H. Dotseth, Director of Applied Sciences and Arts

Main Address: Oakland Community Colege
2480 Opdyke Road
Bloomfield Hills, Michigan 48013

Concerning Xerox "Occupational Technology Series" write

Career Education Program
Xerox Education Group
1200 High Ridge Road
Stanford, Connecticut 06905

Philip Doughty

MONROE COMMUNITY COLLEGE: CALL UP FOR SERVICE

Monroe Community College is a public, two-year, coeducational college serving both day and evening students from the Rochester New York area. The college primarily provides instructional programs leading to terminal associate degrees which prepare students for career fields. Several programs are also designed for those students who will continue for advanced degrees. Non-matriculated students with no immediate career or academic goals are permitted to enroll in most courses.

This case study will focus on two aspects of the institution: 1) the academic program designed to train audiovisual technology specialists and 2) the media production support division of the college.

COMMITMENT

The central administration of Monroe Community College appears to be committed to a total audiovisual program, both in support services and in the academic program. This is evidenced in the spacious facility, the modern equipment and the liberal budget for production and AV services. The Board of Education has provided a highly qualified, enthusiastic staff and has allocated considerable funds for hiring students as support personnel.

AUDIOVISUAL TECHNOLOGY ACADEMIC CURRICULUM

One of the academic programs at Monroe was originally designed to train audiovisual technicians for public schools. However, when the students were trained, the public schools did not have funds for placing them. Currently, fifty percent of the students work towards a Bachelor's degree at other institutions even though the program was intended as a terminal program for support personnel to work with professionals. Many of the AV technician graduates find jobs in nearby businesses and industries and very few students leave the Rochester area, although there are many other jobs available across the country.

The original course structure emphasized production skills rather than curriculum design. The program was originally planned so that graduates would be generalists in the field. However, new procedures will require all students to take core courses during their first year and, during that time, faculty will help them identify and specify interests and needed competencies. During the second year, each student will pursue his speciality (i.e., engineering, creative design, or production). Also, there will still be a generalist route for those students with no specific interest.

No formal recruiting of students within the community is conducted. Since the students are permitted to participate in a practicum, there is a continual flow of communication between the college and prospective community employers.

One of the current options for students includes continuing in a four year academic program leading to a bachelors degree in Educational Technology. This program is offered at Rochester Institute of Technology. The courses that students might take in this program fall in the curricular areas of business management, sales, engineering, and electronics. Another student option is to enter the Monroe program leading to certification in Broadcast Technology.

Problems encountered by the staff of the academic AV technicians department include difficulty in defining the function of the department to the public, the necessity of having at least 12 students enroll in a class before the department can receive credits and the difficulty of combating the failure syndrome verbalized by many entering students.

The following list outlines a typical academic program for a student wishing to obtain a two-year Associate in Applied Science degree in Audiovisual Technology.

Monroe Community College
Audiovisual Technology Program
Typical Academic Schedule

FIRST SEMESTER	Sem.Cr.Hrs.
Eng. 101 English Composition	3
SCIENCE Elective	3
AVT 101 Introduction to Media	3
AVT 102 Media Graphics I	3
AVT 103 Media Photography I	3
PE 101 Physical Education	1
Total	16

SECOND SEMESTER	Sem.Cr.Hrs.
SOCIAL SCIENCE Elective	3
ELECTIVE	3
AVT 111 Technical Operation & Maintenance of AV Equipment	3
AVT 112 Media Graphics II	3
AVT 113 Media Photography II	3
PE 102 Physical Education	1
Total	16

THIRD SEMESTER	Sem.Cr.Hrs.
AVT 201 Duplication of Instructional Media	3
AVT 202 Techniques of Television I	3
AVT 203 Instructional Film Production	3
OR	
AVT 204 Techniques of Audio Production	3
MATHEMATICS Elective	3
SPT 101 Public Speaking	3
PE 201 Physical Education	1
Total	16

FOURTH SEMESTER	Sem.Cr.Hrs.
AVT 212 Techniques of Television II	3
AVT 203 Instructional Film Production	3
OR	
AVT 204 Techniques of Audio Production	3
SOCIAL SCIENCE Elective	3
PE 202 Physical Education	1
ELECTIVES*	6
Total	16

* Typical electives include: Practicum in Instructional Media, Special Problems in Advanced Media, Introduction to Information Resource Centers, and Technical Processes in Information Resource Centers.

MEDIA SUPPORT SERVICES PROGRAM

Audiovisual Materials and Equipment

AV materials and equipment at Monroe are many and varied. Materials are either purchased from commercial sources or produced locally in the AV center. Instructors and AV personnel are both responsible for the selection of commercial materials and the design of in-house productions which include photographs and posters, films and video tapes. The evaluation of all materials is the responsibility of the instructor who uses them.

All AV materials are stored and cataloged in the AV Center. Posters, models, and transparencies, however, become the property of the instructor. Information about new materials is made available to the faculty by the staff of the AV center. Cataloges of commercially produced materials are also accessible to faculty. AV center staff also maintain and repair materials and equipment.

Many faculty members as well as many departments take advantage of the materials and services available from the center, but, according to the AV staff, this is not a universal phenomenon. Those instructors and departments making considerable use of the support services are used as catalysts and advisors to those not currently using the support services.

Media Hardware

A tour of the media production facilities shows a wide range of very modern equipment and well-designed space for production and instruction. In practically every classroom, the absence of blackboards necessitated the use of overhead projectors. Some specific departments were using more media than others.

Closed-circuit Television

Extensive closed-circuit television facilities and services receive a considerable amount of use. Every classroom is connected with the central television studio and all programs in the AV library are available for viewing upon instructor request. Instructors use the direct intercom system to call in requests for video programs.

Production Services

The production services unit of Monroe Community College's Audiovisual Technology Program services thirty-five departments. One of the services is Graphics, which is staffed by one full-time graphic artist who supervises two part-time student workers, two-part-time AVT practicum students, and a full-time photographer.

The materials produced range from signs and simple overhead transparencies to full-color original artwork for slides and full-color three-dimensional scale models. The quality of the graphics materials is of the highest caliber.

Photography

The range in photographic service extends from black and white Kodalith slides of typed materials to studio and location photography. Some limited motion picture production is also available. Audio and video production service is performed by full-time technicians and AVT students. Again, the productions are of the highest quality.

Other full-time service personnel include a film scheduling clerk and a secretary clerk. Of the fifteen full-time employees in AV Tech, six are teaching AV Tech courses.

Instructor and Department Use of Media

Media and media support services are readily accessible to Monroe instructors. The intercom or "call in" system throughout the college allows immediate response to emergency needs and last minute requests as well as regular calls for service.

Again, there is evidence that many types of media are in use throughout the school. Overhead projectors, carousel projectors, slide tape programs, movies, 16mm and super-8, and video programs are all employed. Closed circuit video programs are used by many teachers with the aid of the television studio and technicians.

An in-service program is offered for the teaching faculty of the college every fall. Training is primarily conducted on an individual basis. When the staff member expresses a desire to use a piece of equipment or requires the service of the media services department, appropriate assistance is offered.

Instructors are also allowed to enroll for the regular classes offered in the department. These are usually taken through extensive night school offerings.

To facilitate greater usage, much of the media hardware is located in different academic departments. However, some materials such as films must be ordered in advance through the media library secretary in the Educational Technology department. Specialized software packages and programs are normally housed in the department that uses them.

BUDGET AND FINANCE

Financial Needs

Financial needs of the program are being adequately met. Considerable contact and coordination with the chief administrative officers of the college ensure that student, faculty and administration needs are considered.

Basis for Budget Allocations

Requests for budget allocations are based upon faculty requests, media program instructional needs, and institutional support service requirements.

Development of the Media Budget

The media support services budget is centralized in the media center. Instructional departments do not submit separate budgets to the chief administrative and fiscal officers for media materials, support or equipment. The 1972-73 budget for expendable materials is approximately $25,000.

Commitment to Financing the Educational Media Program

Indications are that there is excellent financing of the overall media program. This is based on observation of the types, quantity, and availability of equipment located throughout the college. The media center director presents his needs to the chief administrative officer with supporting documentation to obtain allocation of funds for his instructional program and the support services

Commitment to Staffing the Educational Media Program

The media center appears to be understaffed for the ambitious program of instruction and support services in which it is involved. Several staff members have dual responsibilities, that is, instruction and support responsibilities. Although the tasks are being performed adequately at this time, it is evident that staff workload problems are going to be encountered in the near future if enrollments continue to increase at present rates.

FUTURE PLANS

The Audiovisual Technology Program appears to be particularly dynamic, and a quick snapshot of such an enterprise is likely to produce considerable distortions. Plans for the future include additional fieldwork and internships, for students, continued joint efforts with Rochester Institute of Technology, and additional restructuring of the core curriculum. Individuals are encouraged to contact Eugene Edwards for up-to-date descriptions of both the academic and support services programs. (Monroe Community College, Rochester, New York 14607.)

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Air Training Command Headquarters, Randolph AFB, Texas

United States Continental Army Command Headquarters, Fort Monroe, Virginia

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FOR MORE INFORMATION: ONGOING PROJECTS

SCOPE (Suffolk County Organization for the Promotion of Education), Dowling College, Oakdale, New York 11769; or SCOPE, Main Street, Setauket, New York 11733; or phone: (516) 751-8500. SCOPE is probably doing more with cable in education than any other organization in the country. They have compiled an excellent CATV Briefing Packet which is free.

District Information, Scottsdale Public Schools, North 44th Street, Education Center, Scottsdale, Arizona 85253; or phone: (602) 949-6211. A cable system with televised instruction from the school to the home, emphasizing preschool and adult education, is being planned in Scottsdale.

New York CATV Project, Center for Analysis of Public Issues, 18th Floor, Madison Avenue, New York, New York 10017; or phone: (212)758-6017.

Center for Policy Research, Inc., 475 Riverside Drive, New York, New York 10027; or phone: (212) 870-2180. The CPRI is studying the neighborhood uses of cable television.

MITRE Corporation, 1820 Dolley Madison Blvd., McLean, Virginia 22101 or phone: (703) 893-3500. In terms of information dispensing MITRE is probably planning more information type programs than any other corporation in the country. The citizens of Washington, D.C. will be able to find out what kinds of jobs (are) available, their accessibility by public transportation, hints on how to apply. A transportation display on another channel (will) tell about traffic conditions and provide bus and rapid transit schedules... (A) health channel... (will) give continuous information on health care, insurance benefits, and public services available. Other programming (will) present information on free legal counsel, group legal services, and education on the rights of citizens. (Price, 1972)